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An asterisk* indicates a peer-reviewed paper

Front cover: The unusual Tongues of Fire rust *Gymnosporangium clavariiforme* on Juniper bushes in Upper Teesdale (see p 120). Photo: *Joyce Simmons*

Back cover: Contributor Zach Haynes at his stand at the YNU Annual Conference in April 2017 (see p118). Photo: *Judith Allinson*

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Editorial

We continue to receive a wide range of articles from our contributors on the almost bewildering array of topics which come under the general heading of 'Natural History in the North of England'. This time we are trying out a 'how to' piece by David Smith, the county Butterfly Recorder. He describes how to get your wildlife records on to a map using only free software and a small number of simple steps. We tried it out with rapid and pleasing success. The map can be of the country, county, or even just one field if your data are recorded to a sufficient degree of accuracy.

When articles arrive with us they go through a number of stages to prepare them for publication. They are converted to our house style of font and text size, and they are edited for clarity, accuracy and very occasionally for length so that they will fit into an available space. It helps immensely if authors have read the 'Notice to Contributors' on the inside back cover of each edition (and the 'Guidance for authors' also referred to). The closer the original article is to the final desired result, the less time our volunteer team need to spend on it, with less need to chase up authors by email to have points clarified, extra information requested, etc.

Authors should also look at a recent edition to see, for example, how scientific names are treated (they should follow the common name, without brackets, and be italicised). For most groups, scientific names should only be used once in the text, on first mention, and English names should be those which are accepted by the relevant expert body, and be capitalised.

Lastly we would like to apologise for the late delivery of the April edition of *The Naturalist*, particularly to anyone who had organised an event and experienced poor attendance because the information did not arrive in time. The delay was largely caused by a communications hitch which is now fully sorted out.

Thirty years of garden wildlife. Inspired by Jennifer Owen

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Why urban wildlife matters

The long-held and indeed, traditional view that the British population earned its money in the towns and went to the countryside for its recreation and wildlife was a casualty of the Second World War when the Ministry of Agriculture, which had spent the 1920s and 30s proselytising intensive farming with almost no success (Bowers, 1998) got the ability to subsidise farmers. The range of grants for 'farm improvements' introduced by the 1947 Agriculture Act rapidly transformed the landscape (Bowers, 1985). It also devastated British wildlife. Concerns were already being expressed in the 1960s (Cheshire & Bowers, 1969). In 1977 in a definitive study of the destruction of farmland habitats, the NCC (Nature Conservancy Council, 1977) contrasted the typical unimproved farm with 20 species of mammals, 37 species of birds and 17 species of butterflies with the typical improved farm with, respectively, 5 mammals, 6 bird species and no butterflies. Losses of farm wildlife continue to the present day and can now be tracked through published official statistics (DEFRA, 2015).

The decline of biodiversity in the farmed landscape coincided with the growth of the movement to protect nature in cities and towns, a movement described as "one of the most significant developments in nature conservation in Britain in the past forty years." (Goode, 2014). This has led to the recognition and identification of important urban habitats, their improved management and protection, and increasingly to the creation of new ones. As a result, we are in a position to assess the extent to which the losses of the rural estate have been mitigated by gains to public and publicly available urban land.

But of course, this is only part of the story. A considerable area of land is occupied by private gardens. There are good reasons for supposing that the wildlife value of urban and suburban gardens, particularly the former, has improved in the post-war period: the reduction in acidity due to the Clean Air Acts – in my garden hard-shelled molluscs (snails) first appeared in the late 1980s and the first colony of the black garden ant was established there in 1991; the growth of feeding of wild birds, to the point where provisioning it has become a substantial industry; and the explosion of interest in wildlife gardening (ibid). But from what base? and how significant are private gardens for UK biodiversity? Some answers to these questions are to be found in the work of Jennifer Owen.

Owen's study

Jennifer Owen's thirty-year study of wildlife in her garden was published in 2008 (Owen, 2008). The thirty years of the study were from 1970 to 2000. The study was an intentional project and not merely a collection of (incidental) observations. It is of seminal importance to the understanding of biodiversity in the UK. It establishes the critical importance of suburban gardens in maintaining British biodiversity. It demonstrates that the typical suburban garden manifests high habitat diversity and that plants and animals can exploit this. It was crucial to Owen's research that her garden was managed in the normal way for a garden. While she

practised the sort of feeding of wildlife typical of gardens, she did not create a wildlife garden. Her results were achieved by intensive and sustained trapping.

The results are best described as amazing. In the thirty years of the study Owen recorded 1730 species of animals including 1553 invertebrates of which 1440 were insects.

Table 1. Results of Owen's thirty-year study

Taxa	**Number of species**	**% of UK total**
Insects	**1440**	
of which:		
Butterflies	23	37
Macro moths	282	32
Micro moths	93	5
Hoverflies	94	37
Other Diptera	50	
Bees	59	23
of which Solitary bees	44	
Wasps	62	21
of which Solitary wasps	54	
Sawflies	91	19
Ichneumons	533	26
Heteroptera	92	
Homoptera	79	
Beetles	421	
of which Ground beetles	33	10
Ladybirds	13	54
Other insects (Odonata, Orthoptera, caddisflies etc)	17	
Other invertebrates	**114**	
of which:		
Molluscs	16	
Woodlice	8	
Harvestmen	11	48
Spiders	79	
Vertebrates	**64**	
of which:		
Amphibians	3	
Birds	54	
Mammals	7	
Total species	**1730**	

Context is given in the right-hand column of table 1. For most of the major taxa the totals amount to 20-30% of UK species. Extrapolating from her data, Owen believes that about 10,000 species of insect out of a national total of about 22,500 are found in her garden. Of those, depending on the taxon, between 20% and 100% breed there; those percentages would rise if habitat diversity were increased by extending the study area to adjacent gardens.

Headingley Hill

From the time that I first moved into my house on Headingley Hill, in 1975, I kept records of the wildlife in my garden. From 1979, I operated a light trap from a top window of my house. By the time of the publication of Owen's book I had a detailed record of observations of the wildlife of my garden from the mid-1970s. From these I can define a 30-year period 1984-2014 which I will compare with Owen's records in her Leicester Garden. Unlike Owen my thirty-year period is not an intentional study. Nonetheless it exists and there are several reasons for making a comparison.

First and most obviously, Owen's work is inspirational and provokes the question: can my garden be that rich? Second her garden is definitely suburban, being close to open country; Linnets nest in it, Turtle Dove and Red-legged Partridge have visited it. My garden per contra, is urban, being less than 2 kilometres from Leeds city centre and surrounded by dense nineteenth century back-to-back and terraced housing. Do Owen's findings apply to urban gardens?

The gardens compared

My garden on Headingley Hill differs from Owen's in other ways than distance from the city centre. Owen's garden is:

> "a typical suburban garden (with) a lawn, flowerbeds, herbaceous borders, rockeries, vegetable patches, fruit bushes, an apple tree, flowering and evergreen shrubs, deciduous trees, conifers, a pond, a compost heap, a glasshouse, paths and paved areas"

My garden is really part of a wood. The moth trap window overlooks a paved yard at the rear with four mature beech trees (a consequence of an attempt by a previous inhabitant to create a beech hedge!) along the backing stone wall. The yard is in permanent shadow from the house and from a magnificent tall sycamore. The front garden slopes up steeply from the front gate with a rockery at the top. It is south facing and receives a lot of sunshine in the winter but mature trees of neighbouring gardens and a large ivy-covered larch in the corner shade the garden in summer except right at the top. Half of the garden is a paved area with azaleas in holes and flowers in pots; the other half is a scruffy lawn. There are two ponds, at the top and bottom of the lawn. Any vegetables and most flowers are grown in pots and bags on the front steps and on the paved areas. A crab tree, now felled, by the front gate carried bird feeders. The tall hedges at the front and sides contain much holly. Beneath the house at the level of the cellars is a lump of Millstone Grit that capped Headingley Hill.

These differences in location, topography and management shade into insignificance in comparison to the differences in trapping methods.

While Owen used a variety of trapping methods, a Malaise trap was of central importance and was operated throughout the study period. She also used a light trap during the early years of her study as well as pitfall traps and "a trap baited with fruit". The trapping effort was complemented by intensive searching for arachnids and insect larvae.

My only trap was a Robinson actinic light trap, identical to that used by Owen, but operated throughout the 30 years. While in the early years a few insects were netted, examined and

released – principally bumble bees - the main additional identification aid was a macro camera providing photographs for identification. Identification via photographs is a rapidly growing technique, probably used by a majority who look at insects. Recently insect identification books have been written that recognise this fact, notably the British Wildlife Field Guides (Ball and Morris, 2015; Falk, 2015). Apart from specimens of two species of carpet moths sent to the YNU recorder of micro-lepidoptera to add to his voucher collection, I killed nothing for identification. By contrast almost all of Owen's invertebrates were killed in the Malaise trap and her fruit trap.

Even with recent improvements many invertebrates cannot be identified without dissection or at least detailed examination of dead specimens. This is particularly so with ichneumons, sawflies, beetles, Homoptera, Hemiptera, solitary wasps, many smaller Diptera and many small spiders. The consequence is that my insect list for Headingley Hill at 567 is only 40% of Owen's list.

We can make meaningful comparisons between the two gardens only for taxa where the Malaise trap is not essential for compiling the lists, namely:

<u>Vertebrates</u>

Birds

Species counts of mammals and amphibians are identical in the two gardens except, unsurprisingly, that Field Vole in Owen's garden is replaced by Brown Rat on Headingley Hill.

<u>Invertebrates</u>

Lepidoptera

- Butterflies
- Macromoths
- Micromoths

Hymenoptera

- Bumble bees
- Solitary bees

Diptera

- Hoverflies
- Other Diptera

Garden Birds

I have always maintained two garden bird lists: those that interacted with the garden, feeding, breeding, drinking, hunting or simply resting in it; and those seen from the garden but merely flying over it. 58 species are on the former list with an additional 9 'overfliers' (Pink-footed and Greylag Goose, Goosander, Golden Plover, Lapwing, Herring Gull, Skylark, Meadow Pipit and Rook).

Owen doesn't draw this distinction but the presence of Skylark and Lapwing might suggest that her 54 species includes overfliers. However, one has to be cautious about this. The Red-legged Partridge fed in her garden as did the Pheasants in mine. Pheasants nest in the grounds of the several student halls of residence in Headingley and one, where I have seen a hen Pheasant

with young, is just at the back of my house. Equally the Woodcock on my list landed at dawn in late October 1982 and fed for some hours in the shelter of the side hedge; so I suppose something similar may have happened with Owen's Lapwing.

Table 2. Bird lists compared

Species	**Headingley Hill**	**Owen's list**	**Species**	**Headingley Hill**	**Owen's list**
Heron *Ardea cinerea*	X	X	Carrion Crow *Corvus corone*	XB	X
Mallard *Anas platyrhynchos*	X	X	Goldcrest *Regulus regulus*	X	X
Red Kite *Milvus milvus*	X		Blue Tit *Cyanistes caeruleus*	XB	XB
Sparrowhawk *Accipiter nisus*	X	X	Great Tit *Parus major*	X	X
Kestrel *Falco tinnunculus*	X	X	Coal Tit *Periparus ater*	XB	X
Woodcock *Scolopax rusticola*	X		Long-tailed Tit *Aegithalos caudatus*	XB	X
Lapwing *Vanellus vanellus*		X	Chiffchaff *Philoscopus collybita*	X	X
Black-headed Gull *Larus ridibundus*	X	X	Willow Warbler *P. trochilus*	X	X
Common Gull *Larus canus*	X	X	Blackcap *Sylvia atricapilla*	XB	X
Lesser Black-backed Gull *Larus fuscus*	X		Treecreeper *Certhia familiaris*	X	X
Pheasant *Phasianus colchicus*	X		Wren *Troglodytes troglodytes*	XB	X
Red-legged Partridge *Alectoris rufa*		X	Starling *Sturnus vulgaris*	X	XB
Stock Dove *Columba oenas*	X		Blackbird *Turdus merula*	XB	XB
Wood Pigeon *C. palumbus*	XB	XB	Fieldfare *T. pilaris*	X	X
Feral Pigeon *C. livia*	XB		Song Thrush *T. philomelos*	XB	XB
Collared Dove *Streptopelia decaocto*	XB	XB	Redwing *T. iliacus*	X	X
Turtle Dove *S. turtur*		X	Mistle Thrush *T. viscivorus*	X	X
Cuckoo *Cuculus canorus*		X	Robin *Erithacus rubecula*	XB	X
Tawny Owl *Strix aluco*	X	X	Spotted Flycatcher *Musicapa striata*	XB	
Swift *Apus apus*	XB	X	Dunnock *Prunella modularis*	XB	X
Kingfisher *Alcedo atthis*	X		Grey Wagtail *Motacilla cinerea*	X	X
Green Woodpecker *Picus viridis*	X	X	Pied Wagtail *M. alba*	X	X

Lesser-spotted Woodpecker *Dendrocopus minor*	XB	X	Waxwing *Bombycilla garrulus*	X	
Greater-spotted Woodpecker *D. major*	X		House Sparrow *Passer domesticus*	X	X
Skylark *Alauda arvensis*		X	Brambling *Fringilla montifringilla*	X	
Swallow *Hirundo rustica*	X	X	Chaffinch *F. coelebs*	X	X
House Martin *Delichon urbica*		XB	Bullfinch *Pyrrhula pyrrhula*	XB	X
Sand Martin *Riparia riparia*		X	Greenfinch *Carduelis chloris*	XB	XB
Magpie *Pica pica*	XB	X	Linnet *C. cannabina*		XB
Jay *Garrulus glandarius*	X	X	Common Redpoll *C. flammea*	X	X
Jackdaw *Corvus monedula*	XB	X	Goldfinch *C. carduelis*	X	X
Rook *Corvus frugilegus*		X	Siskin *C. spinus*	X	
Nuthatch *Sitta europea*	XB				

Key: X = present B = Has bred

The most useful comparison to make is between the breeding birds of the two gardens. Owen lists 9 breeding birds for her garden; my Headingley Hill list is 20 which includes all of Owen's list except Starling, Linnet and House Martin. Linnet reflects the difference between urban and suburban; House Martin reflects the type of building: in the stone houses on Headingley Hill it is replaced by Swift. Starling has never been common on Headingley Hill. The additional species are there because it is part of a wood. Spotted Flycatcher bred successfully in the garden or adjacent ones throughout the 1970s and was last recorded in 1984. Nuthatch nested for several years in a hole in the stonework under the eaves with the male singing from a weeping ash tree that overhangs the garden. Blackcaps have nested in the tall and thick hedge on the side of the lawn on several occasions. Coal Tits nest in the large larch at the bottom. The most surprising bird on the breeding list is Lesser-spotted Woodpecker. In May 2003, a pair occupied a pollarded tree in a neighbouring garden. The female excavated a hole, removing material and occasionally being fed by the male from the entrance. At other times the male sang from any of three adjacent trees. Intense nesting activity continued for four days. After which the birds disappeared.

Butterflies

Owen mainly caught butterflies in her Malaise trap, but experiments with hand-netting in the 1980s showed that this gave biased results in terms of frequencies. At Headingley Hill butterflies were not caught but instead identified in the field. Daily counting was started in 1997 since when 3 species have been added to the list: Speckled Wood in 2000; Brimstone in 2002 and Ringlet in 2010 (Table 3). Speckled Wood has become well-established and breeds in and around the garden. Ringlet was not recorded by Owen but my first record was after the end of her study period. Despite a substantial recently-established population within 500 metres

of the garden it remains a vagrant with me. White-letter Hairstreak was present from 1986 to 1990 when the only Wych Elm *Ulmus glabra* close to the garden was felled.

In total I identified 20 species on Headingley Hill against Owen's 23. Her list includes 4 species not seen by me: Marbled White, Small Heath, Common Blue and Silver-washed Fritillary. The first three are grassland species and were not to be expected in my garden; Marbled White in West Yorkshire is confined to limestone grassland. Silver-washed Fritillary is classed as: "former resident, now extinct, except for very occasional wanderers" (Frost, 2005).

Table 3. Butterfly records for Headingley Hill 1997-2014

	Species days in each year																	
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Species																		
Small Skipper *Thymelicus sylvestris*							**New**	2	0	0	0	0	0	0	0	0	0	0
Large Skipper *Ochlodes venatus*	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1
White-letter Hairstreak *Satyrium w-album*	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Orange Tip *Athocharis cardamines*	6	7	3	4	3	3	2	10	2	0	3	0	1	0	1	0	3	0
Green-veined White *Artogeia napi*	11	11	4	4	2	2	14	17	9	10	17	5	12	12	4	6	24	25
Small White *Artogeia rapae*	12	1	2	7	1	1	22	5	4	13	2	1	7	7	1	1	24	6
Large White *Pieris brassicae*	20	27	13	26	6	15	46	34	29	29	13	25	44	24	5	18	80	44
Brimstone *Gonepteryx rhamni*					**New**	1	1	0	0	1	0	0	0	0	0	0	1	1
Ringlet *Aphantopus hyperantus*													**New**	2	0	0	0	0
Gatekeeper *Pyronia tithonus*	1	0	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0
Meadow Brown *Maniola jurtina*	3	4	2	6	0	2	9	3	7	25	2	0	2	0	2	0	2	6
Wall Brown *Lasiommata megera*	7	1	0	8	0	2	2	12	3	3	0	0	0	0	0	0	0	0
Speckled Wood *Pararge aegeria*			**New**	1	0	0	5	2	18	35	8	16	26	15	5	13	7	5
Comma *Polygonia c-album*	3	6	4	13	5	7	7	8	6	24	8	11	6	3	12	0	5	3
Small Tortoiseshell *Aglais urticae*	27	5	3	6	5	7	15	5	1	5	8	1	1	0	1	6	2	1
Peacock *Inachis io*	21	17	0	11	2	3	7	5	6	12	10	4	3	2	3	5	25	6
Red Admiral *Vanessa atlanta*	17	9	2	18	4	4	17	5	8	31	10	5	9	1	4	0	0	6
Painted Lady *V. cardui*	0	1	0	2	0	2	25	6	0	12	1	0	8	0	0	0	0	0
Small Copper *Lycaena phlaeas*	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
Holly Blue *Celastrina argiolus*	8	17	8	2	1	4	19	17	10	20	14	8	6	7	7	54	5	3
Total species	**13**	**12**	**9**	**13**	**9**	**13**	**16**	**15**	**12**	**14**	**12**	**9**	**12**	**9**	**11**	**7**	**12**	**13**
Total species days	**139**	**106**	**41**	**108**	**29**	**53**	**196**	**133**	**103**	**231**	**101**	**76**	**124**	**71**	**45**	**103**	**180**	**108**
Total List	**16**	**16**	**16**	**17**	**17**	**18**	**18**	**19**	**19**	**19**	**19**	**19**	**19**	**20**	**20**	**20**	**20**	**20**

Macro-moths

Owen operated an actinic light trap irregularly between 1970 and 1992 and the Malaise trap continuously throughout the thirty-year study period (1970-2000). She also used a trap "baited with fermenting fruit" occasionally. Macro-moths were caught in all of these traps. On Headingley Hill a Robinson actinic light trap was operated from the open window of a second-floor room from 1984-2014. When she analysed her results Owen concluded that numbers of macro-moths were declining throughout her period. I concluded the same for the catches on Headingley Hill (Bowers, 2003).

Owen caught 284 species in her Leicester garden. With 265 species, the Headingley Hill total was just 7% lower. However, concordance between the two sites was not as high as these aggregates might suggest. Thus:

- 60 species were seen on Headingley Hill but not in Owen's garden
- 75 species were recorded in Owen's garden but not on Headingley Hill.

Owen divides her records into 4 categories:

- Once only records;
- Scarce, 2-9 records over the thirty-year period;
- Uncommon, less than an average of 1 record per year (< 30 records);
- Common, more than 1 record per year

Table 4 analyses the discordance between the sites using these categories.

Table 4. Analysis of discordance of Macro-moth records

	Headingley Hill but not Leicester garden		**Leicester garden but not Headingley Hill**	
Leicester garden status	**Number**	**%**	**Number**	**%**
Common	6	10	10	13
Uncommon	5	8	6	8
Scarce	18	30	33	44
Once only	31	52	26	35

82% of the Headingley Hill macro-moths that haven't been recorded in Owen's Leicester garden have been recorded fewer than 10 times during the study period and over half (52%) have been recorded only once. Equally 79% of the Leicester garden species not recorded on Headingley Hill were recorded fewer than 10 times. This suggests that most of the difference between the two gardens was made up of vagrants or wanderers. The degree of discordance on common or regular species was small, amounting in total to only 16 species.

Several of the common species of Owen's garden are open country species unlikely to be found on Headingley Hill (Broom Moth, Clouded Brindle, Straw Underwing); Stout Dart is probably extinct in Yorkshire and is declining everywhere, but the failure to record some of the others is puzzling. This is particularly so with Dusky Thorn whose food plant is Ash *Fraxinus excelsior*, there are two Ash trees overhanging the garden and several more within 100 metres. A possible

explanation is that the moth trap overlooked the back yard where there are no close Ash trees. However other Ash-tree species such as *Prays fraxinella* were frequently caught.

Table 5. Further analysis of macro-moth discordance.

Common in Leicester garden; not seen on Headingley Hill	**Common on Headingley Hill; not seen in Leicester garden**
Tawny Speckled Pug *Eupithecia icterata*	Slender Pug *Eupithecia tenuiata*
Dusky Thorn *Ennomos fuscantaria*	Red-green Carpet *Chloroclysta siderata*
Brindled Beauty *Lycea hirtaria*	The Pheonix *Eulithis prunata*
Swallow Prominent *Pheosia tremula*	Satellite *Eupsilia transversa*
The Vapourer *Orgyia antiqua*	Straw Dot *Rivula sericealis*
Garden Tiger *Arctia caja*	
Stout Dart *Spaelotis ravida*	
Broom Moth *Melanchra pisi*	
Straw Underwing *Thalpophila matura*	
Small Clouded Brindle *Apamea unanimis*	

Garden Tiger and Swallow Prominent together with species of Swifts (Hepialidae), Prominents (Notodontidae) and Footmen (Erebidae) that are classified by Owen as unusual are caught in the Leeds outer suburbs but are surprisingly absent or extremely rare on Headingley Hill. This cannot be explained by a lack of food plants so there is perhaps some factor (pollution?) which is still limiting the spread of these essentially rural species into the city centre.

The common Headingley Hill species not found by Owen are more easily explained. Slender Pug was dependent on a Sallow planted beside the main pond when it was created. The species was caught every year until 2009 when the Sallow succumbed to Honey Fungus *Armillaria mellea* and was removed. So far as I am aware there is no other Sallow within 1 km. of the garden. Three of the other four species have expanded since the turn of the century and hence after the end of Owen's survey period. The Pheonix and Red-green Carpet slightly overlap with it, being first caught in 1997. Straw Dot was first caught in 2004 but has been plentiful since then. Indeed: "The spectacular expansion of this moth must be worth mentioning this year with quite huge numbers turning up at some sites."(Frost, 2009)

Micro-moths

I recorded 152 species on Headingley Hill. Owen recorded far fewer in her garden; she says 93, but in fact 2 were only identified to the generic level (Table 6).

Table 6. Micro-lepidoptera records

	Headingley Hill only	Leicester garden only	Both
Yponomeautidae	18	4	2
Oecophoridae	14	6	5
Tortricoidea	59	30	20
Pyraloidea	36	42	27
Pterophoridae	10	5	3
Other families	15	10	2
Total All Micros	**152**	**97**	**59**

Apart from some Tineidae (see Plate 1, centre pages) which chewed their way through clothes and carpets throughout the thirty year study period and one or two other common house moths, almost all the micros of Headingley Hill were caught in the Robinson trap. Owen caught a few of her micros similarly and a very few in the Malaise trap but most of her records were of larvae found on foodplants. It appears that her methods were successful for Pyralids and among them especially so for grass moths of the genera *Calamatropha, Crambus, Agriphila* and *Catoptria* where she recorded 6 more species than were caught on Headingley Hill. It seems that among grass moths only *Chrysosteuchia culmella*, where catches were frequently in double figures, is strongly attacted to light. But Owen's methods seem not to work for the smaller moths, Yponomeutidae and Oecophoridae and to have been only moderately successful for Tortricidae. Overall it appears that the Malaise trap doesn't work very well for trapping micro-lepidoptera. However, Owen sent its contents to outside specialists for identification and it is possible that she didn't have a specialist in Lepidoptera. There was of course an advantage to Owen's approach. Light trapping doesn't allow the trapper to distinguish between breeding species and casuals, except statistically. Finding larvae establishes breeding.

Bumblebees

Owen recorded 13 species of bumblebees in her garden and I have recorded 15 in mine.

The compositions of our respective populations are somewhat different (Table 7). Owen recorded two species, the Red-shanked Carder Bee and the Large Garden Bumblebee which are now believed to be extinct in Yorkshire. On Headingley Hill I have one record and photo for 1987 of a queen of the Northern White-tailed Bumblebee *B. magnus* which is now again treated as a separate species (it was in the 1980s too, when I found a specimen kindly resting on my front doorstep). I also have several records and photographs of the Gypsy Cuckoo Bee which is inquiline with bumblebees of the *B. lucorum* complex. Finally, Owen's study period finished before the dramatic colonisation of the Tree Bumblebee .

On Headingley Hill the Gypsy Cuckoo Bee is not as regular as the Vestal Cuckoo Bee which in July is often present in substantial numbers. Owen recorded no cuckoo bee more than three times in her thirty-year period, but this reflects the situation with bumblebees in general. Only the Common Carder Bee was recorded with any frequency. Her annual counts for the common garden bumblebees (*B. hortorum, B. terrestris and B. pratorum*) amount to no more than a month's records for Headingley Hill. This Is probably again the result of dependence on the

Malaise trap. Bumblebees are best recorded by watching them feeding on flowers.

On Headingley Hill I have recorded the nests of four species of bumblebee (*B. hypnorum, B. pascuorum, B. lapidarius and B. terrestris*) in tit boxes after the birds have flown, and in compost heaps.

Table 7. Bumblebee records

Headingley Hill	Leicester Garden	Headingley Hill	Leicester garden
White-tailed Bumblebee *Bombus lucorum*	White-tailed Bumblebee	Barbut's Cuckoo Bee *Bombus barbutellus*	Barbut's Cuckoo Bee
Buff-tailed Bumblebee *B. terrestris*	Buff-tailed Bumblebee	Field Cuckoo Bee *B. campestris*	Field Cuckoo Bee
Red-tailed Bumblebee *B. lapidarius*	Red-tailed Bumblebee	Red-tailed Cuckoo Bee *B. rupestris*	Red-tailed Cuckoo Bee
Early Bumblebee *B. pratorum*	Early Bumblebee	Forest Cuckoo Bee *B. sylvestris*	Forest Cuckoo Bee
Garden Bumblebee *B. hortorum*	Garden Bumblebee	Gypsy cuckoo Bee *B. bohemicus*	
	Large garden Bumblebee *B. ruderatus*	Vestal Cuckoo Bee *B. vestalis*	Vestal Cuckoo Bee
Common Carder Bee *B. pascuorum*	Common Carder Bee		
	Red-shanked Carder Bee *B. ruderarius*		
Tree Bumblebee *B. hypnorum*			
Northern White-tailed Bumblebee *B. magnus*			

Solitary bees

Owen recorded 45 species of solitary bees caught in her Malaise trap. On Headingley Hill identification depended on the camera with which 11 species were identified, all of which were listed by Owen.

At least two species nest in cracks and holes in the York stone walls of the house (*Lasioglossoum morio* and *Osmia leaiana*, the latter parasitized by the solitary wasp *Monosapyga clavicornis*). *Andrena fulva* and *A. haemorrhoa* also breed in the garden, the former making holes in bare patches of the lawn. Other species of *Andrena* and *Osmia* are found gathering pollen from the flowers and shrubs and inspecting the stonework. Good photographs can be taken of them, but these photographs are unfortunately not good enough to permit identification to the specific level. However, with the help of Falk's new book (Falk, 2015) I hope in the future to go some way towards remedying that deficiency.

Hoverflies

Owen recorded over 60, 000 hoverflies of 94 species in her Malaise trap over the 30-year study period. On Headingley Hill I started recording hoverflies only in 2009, photographing as many as possible and identifiying them from the photographs. By 2014 I had a list of 49 species. The difference of 45 species from Owen's list largely comprised small black hoverflies that could not be identified without killing them and I therefore thought I had reached the limit of the list that could be compiled with my technology. This has, more or less, been proved correct, since in the following two years I only added one species, *Eumerus funeralis* whose larvae were presumably eating the bulbs of the Procosmia on which it was resting.

Owen classified her hoverflies into four groups:

(a) Those known or assumed to breed in her garden (25 species – 27%);
(b) Those assumed to have bred in the surrounding area (25 species – 27%)
(c) Casual visitors (30 species -32%)
(d) Recorded in one year only (14 species – 15%)

On the same classification, my 49 Species are

(a) 16 – 35%
(b) 16 – 35%
(c) 9 – 20%
(d) 5 – 11%
(e) Not recorded by Owen – 3 (*Sphegina clunipes, Melangyna labiatum, Volucella inanis*)

Thus, casual visitors appear under-represented on the Headingley Hill list, which one might expect since smaller visiting hoverflies are more likely to escape the camera but to be caught in the malaise trap.

The only species for which I have proof of breeding are *Helophilus pendulus* and *Myathropa florea* both of which I have watched ovipositting in large plant pots.

The magnificent hoverfly *Volucella inanis* (see centre pages plate 1) is spreading north up the centre of England and has been seen every year on Headingley Hill since 2009. *V. inanis* grubs feed on the larvae of social wasps. Since there are usually several nests of the Common wasp *Vespa vulgaris* in and about the garden and pest controllers are not infrequently needed to remove nests from under the slate roofs, I hope that it is breeding.

Other Diptera

With her Malaise trap, supplemented, for Flesh- and Blow-lies, by a trap baited with 'fish heads, skins and offal' Owen recorded 50 species of Diptera other than hoverflies. This number included the larva of a fly found in a blackbird's nest and two leaf miners. My methods were similarly eclectic. Some flies were caught in the Robinson trap, especially Tipulids and non-biting midges but also dung, flesh and blow flies. From 2009, a number of species were found and photographed at flowers during the search for hoverflies. Flies caught in the light trap and found dead on window sills were identified to species level. This was not always possible with the photographs, where identification was only possible to the genera (e.g. *Sepsis*) or even

family level. With the addition of the same two leaf miners, on holly and honeysuckle that Owen found, I recorded 29 species. However, the composition of my smaller total was very different to Owen's list. Species that she didn't find are listed in Table 8.

Table 8. Diptera recorded on Headingley Hill but not in Owen's garden

Tipula oleracea	*Coenosia tigrina*
T. maxima	*Graphomyia maculata*
Chironomus luridus	*Opomyza florum*
Empis livida	*Ptychoptera contaminata*
Bombylius major	*Scathophagia stercoraria*
Sicus ferruginea	*Coremacera marginata*
Poecilobothrus nobilitatus	*Tachina fera*
Anthomyia procellaris	*Eriothrix rufomaculata*
Thereva nobilitata	

The totals we have both recorded are low and probably with active netting we could do better. Owen's interest was undoubtedly with hoverflies and she devotes a whole chapter of her book to analysing her records of them. I feel sure that I would have recorded more dipterans had I started earlier and put in more time looking for them.

Dragonflies

The only certain breeding species on Headingley Hill has been Blue Hawker *Aeshna cyanea*. This was established in the 1990s and was monitored until 2007 when 18 individuals attempted to emerge, of which 6 failed, 4 being eaten by Common wasps. There were few emergences in subsequent years and the population had died out by 2010. The pond, while large for a garden pond, is probably too small and too isolated from other ponds to sustain a population. Furthermore, it lacks sufficient tall and dense emergent vegetation to protect dragonflies from predation by wasps. Additionally, it has a good population of Smooth Newts *Triturus vulgaris* which probably eat the larvae.

Brown Hawker *Aeshna grandis* and Migrant Hawker *A. mixta* occasionally occupy the pond and may lay eggs, but there has been no evidence of emergence. The other species one might look for is Common Darter *Sympetrum striolatum*. A male held territory in 2014 but no females were seen. Over 30 years there has been no more than fleeting visits from the three common damselflies: Azure *Coenagrion puella*; Large Red *Pyrrhosoma nymphula* and Common Blue *Ischnura elegans*.

Owen regards dragonflies as accidentals in her garden with no suggestion of any breeding attempts on her pond which, from her plan, seems to be smaller than the smaller of the two ponds on Headingley Hill. She lists 7 species she has seen in her garden but it is highly probable that two of these, and possibly three, are wrongly identified.

Conclusions

- The number of species recorded on Headingley Hill is significantly lower than in Owen's Leicester garden;
- This is mostly attributable to Owen's use of a Malaise trap which yields large numbers of dead invertebrates;
- Where trapping and observational methods are directly comparable the results for Headingley hill are not demonstratively inferior to Owen's results and in some cases are better;
- This means that her basic hypothesis concerning the importance and richness of suburban gardens for biodiversity are broadly supported by our work;
- Which shows that urban gardens share this feature;
- Owen's study was deficient in its use of a light trap which is shown to be crucial for recording Lepidoptera, especially Micro-lepidoptera ;

Further thoughts

Methodology: Analysing the results of trapping with a Malaise trap needs experts. Owen had that expertise for some taxa but not others (Diptera, other than hoverflies; Micro-lepidoptera). Operating a Malaise trap together with a light trap at the intensity of that used on Headingley Hill, plus the required intense observational work would be at least one full-time job and therefore not possible for someone with a full-time university teaching post as we both had!

Timing: The Headingley Hill study started 14 years later than Owen's. Had it started in 1970 there would have been no snails or garden ants and (probably) fewer bees and butterflies because the environment was highly acid due to smoke pollution. But both studies occurred over a period of substantial amelioration of the urban environment.

Acknowledgements

Several people have assisted me by identifying insects I have photographed. I would particularly like to thank Ian Armstrong who has patiently helped me through the identification of hoverflies and beyond. John Coldwell and Roger Morris have also contributed to my attempts at identifying diptera. Charlie Fletcher over many years adjudicated on moth records. Finally, my colleague Bill Ely has dealt with anything I threw at him including showing me what was hanging around the pond.

It of course goes without saying that none of these people is responsible for what I have done with their advice. Errors and omissions remain solely with me.

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A Review of the Thresher Shark, Fox Shark or Sea Fox in Yorkshire waters

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Introduction

Classification, distribution and life history. The shark order Lamniformes or mackerel sharks include seven living families, one being the thresher sharks, recognized by an extremely elongate dorsal lobe of the caudal fin, which approaches the length of the trunk of the body. Currently there are three named species, the Common Thresher *Alopias vulpinus* (Bonnaterre), the Bigeye Thresher *Alopias superciliosus* (Lowe) and the Pelagic Thresher *Alopias pelagicus* Nakamura plus a fourth as yet undescribed taxon known only from allozyme enzyme analysis (Eitner, 1995; Compagno, 2002).

The Common Thresher is the largest of the three named sharks and reaches up to 6m in length. It has a circumglobal distribution in tropical and temperate waters, both oceanic and coastal, with young typically found in shallower waters. Females reach maturity at around 7 years and males at around 5 years. It has an aplacental viviparous mode of reproduction with oophagous embryos that feed on undeveloped eggs ovulated by their mothers. Females typically give birth to four 'pups' at a time after a gestation of nine months (Moreno *et al.*,1989; Compagno, 2002).

Conservation status. A combination of slow life history characteristics, a low capacity to recover from moderate levels of exploitation and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries, have produced severe global population declines. Consequently all members of genus *Alopias* are listed as 'Vulnerable' globally on the IUCN Red List of Threatened Species (http://www.iucnredlist.org/details/full/39339/0)

Origin of vernacular names. The use of the highly specialised tail as a weapon with which to stun or kill prey was probably based on supposition rather than on detailed observation, however, the belief became part of fishing/seafaring folklore, giving rise to the 'thresher' or 'thrasher' element of its vernacular name (OED, 1989). The earliest example of its usage in

the English language, based on classical Greek translations, dates back to the 17th century where John Donne in *The Progress of the Soul* (1612) describes the fanciful tale whereby the 'Flail-finn'd Thresher' cooperates with the 'Steel-beak'd Sword-fish' in mortally attacking the 'Sluggard Whale', one by lashing, the other by impaling. The use of the term 'fox' in the sense of 'Sea-fox' or 'Fox shark', relates to the conspicuous nature and posture of the tail being reminiscent of a fox's brush and was first coined by William Borlase in the *Natural History of Cornwall* (Borlase, 1758).

Occurrence in the North Sea

The Common Thresher is the only thresher known to occur in the coastal waters of the British Isles (Quéro, 1984). Ellis (2004) listed 36 occurrences within the North Sea basin from the Norwegian coast south to the eastern end of the English Channel from 1881 to 2004. In addition to Ellis's list, the *Daily Chronicle* for 11 June 1906 reported a 'Thresher' secured by three Southwold [Suffolk] fishermen.

The Common Thresher has long been known to visit Yorkshire waters and is regarded as one of the more exotic and newsworthy of fish occurrences. There have been occasional coastal strandings and specimens have occurred as by-catches in salmon nets off Whitby, Filey and Bridlington and off-shore in trawl nets. Clarke & Roebuck (1881) referred to the "Thresher, Thrasher or Fox Shark" as an "accidental visitant from the Atlantic and the Mediteranean Sea, of rare occurrence". Grabham (1907) described it as "a rare visitor" and Spaul (1956) as "rare" with "few records".

Ellis (*loc. cit.*) lists six fish trawled off the Yorkshire coast 1956 to 1971 in latitudes within regions of the Silver Pit (a submerged Quaternary river valley c.45km east of Spurn Head) and the Dogger banks (shallow mud/sand banks c.100km east of the Yorkshire coast). This study details eleven additional occurrences in Yorkshire waters from 1854 to 2007.

Inventory of Yorkshire records

- During mid September 1854, while fishing about a mile out from Scarborough, John Joseph Briggs and a party of recreational anglers encountered a specimen, estimated to be 18-20ft (5.5-6m) in length, in the process of hunting for Herring *Clupea harengus* (Briggs, 1854).
- A 12ft (3.6m) long specimen caught at Bridlington, 15 October 1868, was initially preserved in the Leeds Museum (Clarke & Roebuck, 1881) but no longer exists in the collections (Rebecca Machin, Leeds City Museum *pers com*. 2.ii.2016).
- One was caught in the Whitby area some years pre 1881 (Stephenson, MS in Clarke & Roebuck 1881).
- A specimen 5ft (1.5m) in length washed ashore at Teesmouth near Redcar in October 1879 (Thomas H. Nelson MS in Clarke & Roebuck 1881).
- An 11ft (3.35m) specimen was landed at Hornsea on 19 September 1883 (Dobree 1883, Clarke & Roebuck 1883).
- In August 1898 "… when a waterman was walking round the rocks in the vicinity of the [wreck of] s.s. *Glentilt*, he found a large shark evidently left by the tide. It was nearly dead when found and bleeding very much. It measured 14ft 6½ inches (4.4m) in length and 5ft (150cm) round. Its tail measured 7 feet (2m) and the two fore [pectoral] fins 2 feet (60cm) each." The 'monster' was "placed on view on the sands at Kettleness and a charge of 3d was made to repay

the men for their trouble in taking it round the rocks to a convenient place for the visitors" (*Whitby Gazette* 26 August 1898). The specimen had evidently been injured on the ironwork of the wrecked steamer and, from a photograph by Thomas Watson of Lyth, Stephenson (1901 & 1907) concluded that it was "a Fox Shark or Thrasher."

- On 12 July 1907 "... a fine specimen of the Fox-Shark or Thrasher was captured in salmon nets of John Hall, fisherman, on the Skate Heads within the Whitby Rock-buoy. After a heavy struggle and with the assistance of other cobles, it was with considerable difficulty eventually got into the coble, which the crew quickly vacated in consequence of the shark's severe struggles, snapping with its jaws trying to bite the men and also to strike with its long and powerful tail. It was at last killed, brought into Whitby and exhibited. When first brought to shore it measured in length from snout to the end of its tail 15ft [4.6m]; I measured it towards night and found it to be but 14 feet 4 inches long, the pectoral fins measuring about 24 inches each in length and on the morning of Saturday 13, it only measured 14 feet, the shrinkage in length in 24 hours being exactly one foot" (Stephenson 1907). A photograph of this specimen was produced as a postcard by the Whitby photographer John Thomas Ross (1862-1929) and entitled '*Monster Shark caught at Whitby July 12th 1907*'. This image is reproduced in Cook (1994 & 2013). The specimen, placed on a cart and surrounded by eager observers, is shown lying on its left side, displaying its ventral aspect to the camera. This reveals the absence of claspers associated with the paired pelvic fins, thus showing it to be a female.
- A 12ft (365cm) specimen caught in salmon nets at Filey on 28 July 1928 was seen by W.J. Clarke (1944).
- On 24 and 25 July 1933 a specimen judged to be about 20ft (6m) long was encountered at close range by Mr Harry Drewery and his brother while inspecting crab pots about half a mile off shore at Withernsea. The brothers witnessed the fish leap about ten feet out of the water (*Hull Daily Mail* 27 July 1933).
- A 13ft (4m) specimen caught at Whitby 31 July 1934 was seen by W.J. Clarke (1944).
- On 24 September 1956 a 403cm 185kg male was caught in Silver Pit (Krefft & Kotthous, 1958; Ellis *loc.cit.*).
- On 24 September 1956 a 406cm 100kg male was caught on the Dogger Banks (Krefft & Kotthous, 1958; Ellis, *loc.cit.*).
- On 6 September 1962 a male was trawled on the Dogger Banks at 54°05N 02°30' E (Krefft, 1964; Ellis, *loc.cit.*).
- On 6 October 1962 a 375cm male was caught in a pelagic pair trawl on the Dogger Banks at 54°05N 02°17' E (Krefft, 1964; Ellis, *loc.cit.*).
- On 5 October 1971 a 402cm specimen was caught in a pair trawl on the Dogger Banks at 54°10N 03°10' E (Blacker, 1973; Ellis, *loc.cit*).
- On 8 October 1971 a 450cm specimen was caught in Silver Pit at 53°55N 02°55' E (de Groot, 1973; Ellis, *loc.cit*.).
- On 18 July 2007 Fisherman Pip Farline caught a 300cm Thresher Shark that had become entangled in his salmon nets, 200 metres off Filey (http://www.glaucus.org.uk). With the help of other fishermen, the specimen was hauled onto the fishing boat which was shorter than the shark (http://www.fishupdate.com). After being taken to Scarborough fish dock it was dissected and found to be a female which had recently produced at least two 'pups'. It measured 14ft 9inches (449cm) and weighed approximately 500lb (225kg) (http://www.Trawlerphotos.co.uk).

Conclusions

Using data from the combined 48 records, this study reviews their distribution, periodicity, seasonality, length range and thereby the population composition in the North Sea.

Distribution in the North Sea. Ellis (*loc. cit.*) shows that most (25) reported occurrences are concentrated in the southern North Sea south of the Wash i.e. below latitude 53.0° N, with only three reported north of Blyth, latitude 55.0° N. Suggested reasons for this southern bias include its possible use as a nursery ground, the seasonal abundance of small pelagic prey fish or seasonal patterns of fishing practices. However, this study lists 16 occurrences off the Yorkshire coast, thus extending the area of greatest concentration north to latitude 54.50° N.

Curiously there is a considerable geographical gap in recorded occurrences from the Wash to the Humber, neither the commercial fishing industry (see Ellis, *loc.cit.*) nor the annual reports of the Lincolnshire Naturalists' Union 1905 to 2011, including Smith (1915), provide evidence from the Lincolnshire coast. Charlie Barnes of the Lincolnshire Records Centre (*pers. com.* 10.vi.2016) speculates that this absence could be due to the particularly expansive Lincolnshire beaches and shallow shore contours preventing larger fish, and boats from which they might be spotted, from getting close in shore.

Periodicity. Commencing in 1854, Figure 1 shows that occurrences have been reported in most decades. Absences during the 1910s and 1940s may have been due to reduced fishing activities during World Wars 1 and 2 respectively, though the absence during the 1990s and 2010s is unexplained. Progressive increases in occurrences notably from the 1970s could be associated with recent increases in sea surface temperatures in the English Channel and southern North sea (Leterme *et al.*, 2008).

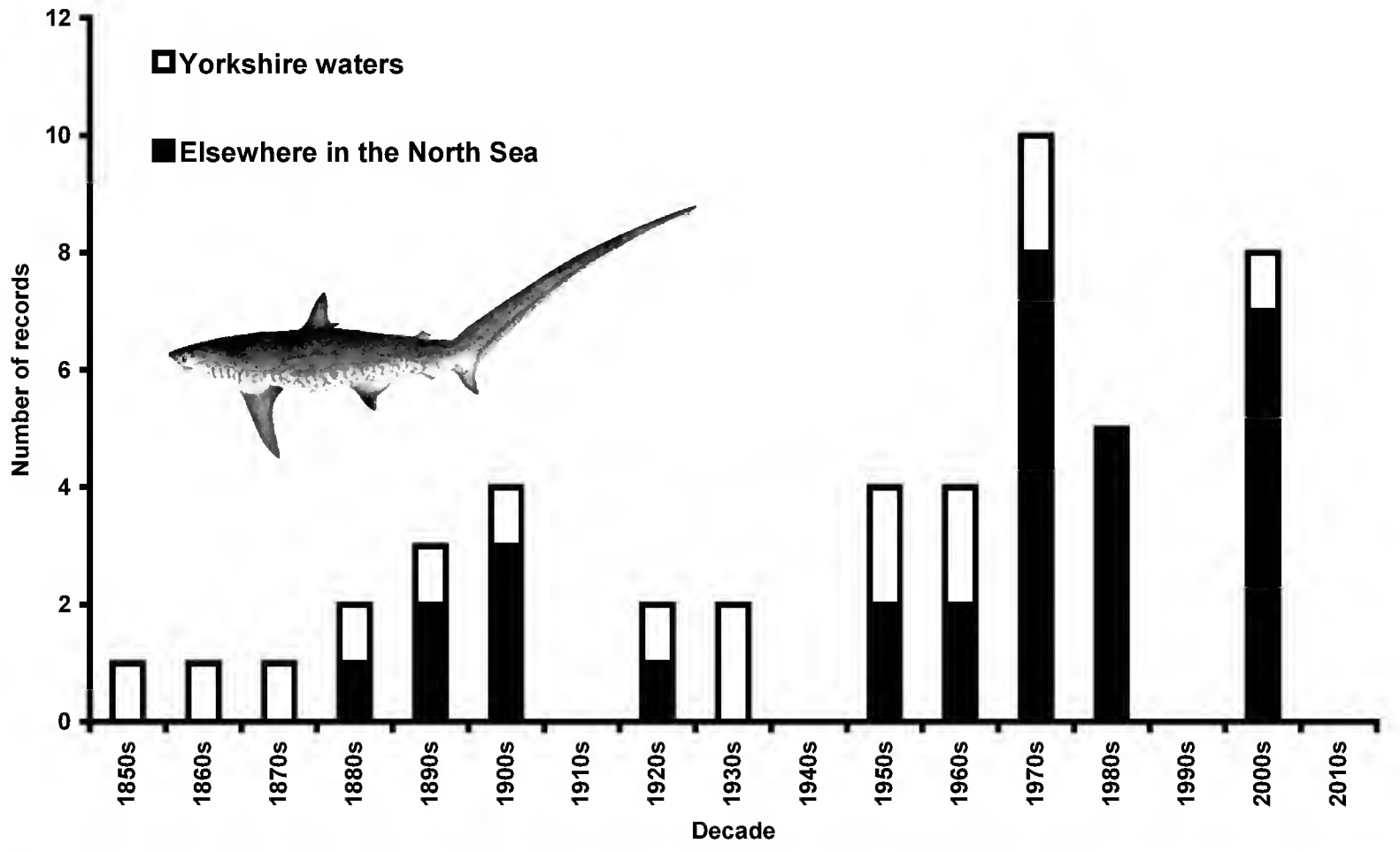

Figure 1: Periodicity (by decade) of recorded occurrences in the North Sea.

Seasonality. Documented occurrences in the North Sea have ranged from March to 21 November. Figure 2 shows that most have been present during the summer and autumn, June to October, though the scarcity of August records is unexplained.

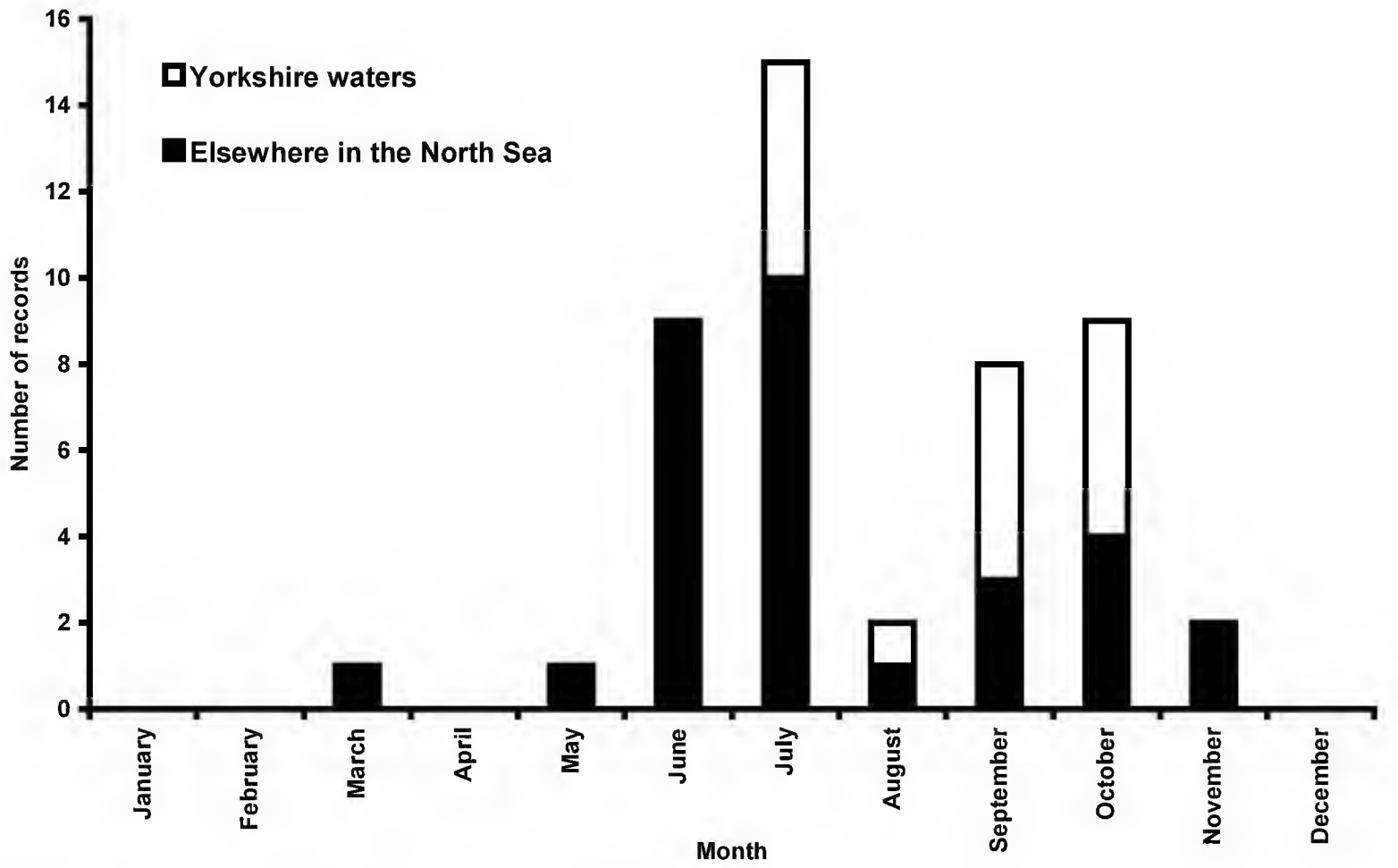

Figure 2: Seasonality of North Sea and Yorkshire coast records.

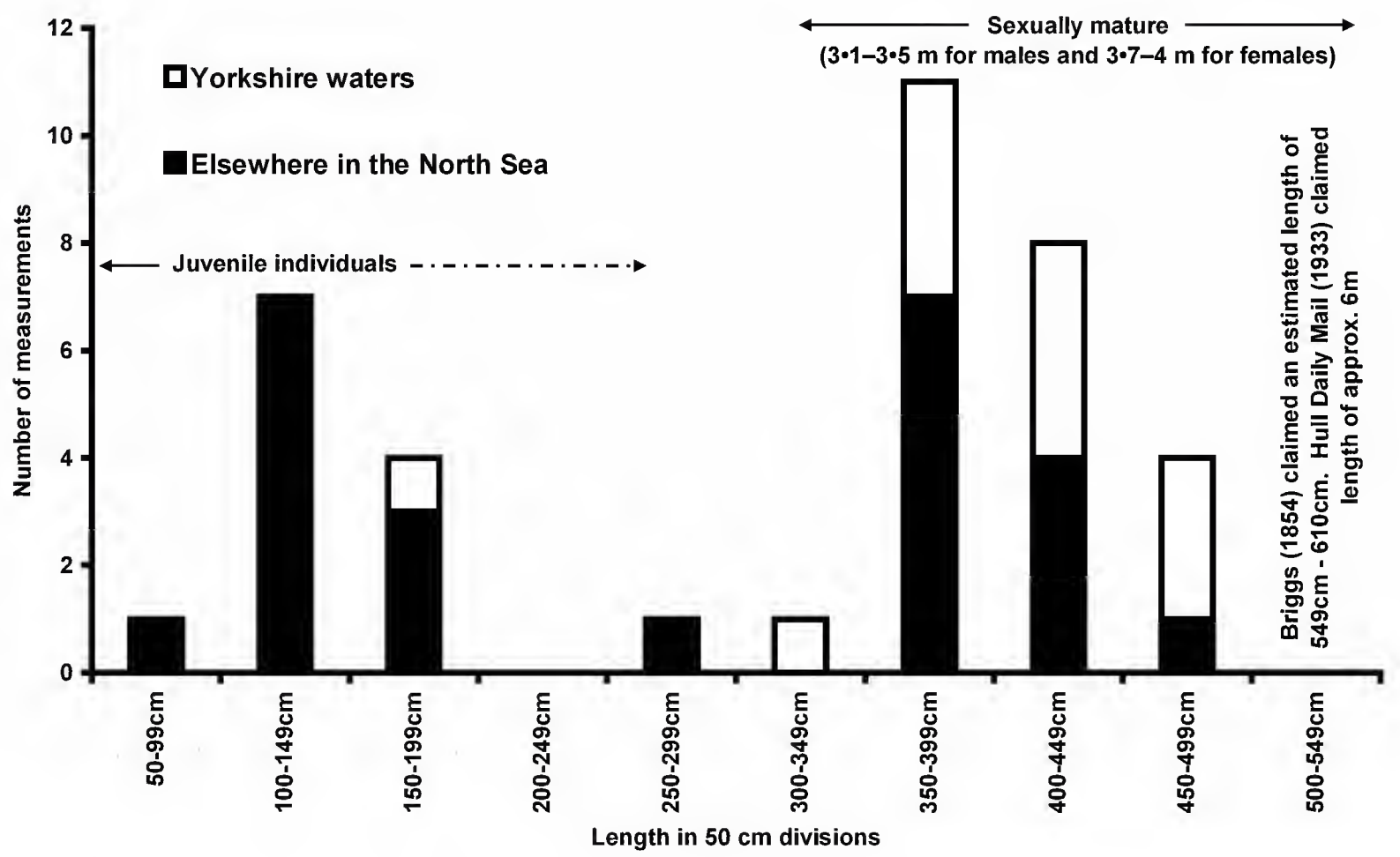

Figure 3: Claimed lengths (in 50cm divisions) of North Sea and Yorkshire coast records.

Length. Figure 3 plots the claimed length measurements of North Sea specimens from Ellis (2004) and this study, ranging from 95cm to 457cm with Briggs (1854) claiming an estimated, though unconfirmable, length of 549cm - 610cm for the fish observed at close quarters off Scarborough in 1854. Ellis (*loc.cit.*) counselled that length data should be used with caution since most reports do not identify which measurement was recorded.

With fish reputedly becoming sexually mature at lengths over 310cm (3.1–3.5m for males and 3.7–4.0m for females), and with maximum lengths reported in the range of 5.6–6.1m (Quéro, 1984; Compagno, 2002), there would appear to be two distinct size/age groups represented in the North Sea (see Figure 3). These consist of a cohort of smaller, evidently juvenile individuals ranging from 95cm to 180cm and a separate group of much larger, evidently adult individuals ranging from 350-457cm.

Ellis's (*loc.cit*) suggestion that the southern North Sea may function as a Thresher Shark nursery receives support from this analysis.

Notes on predatory behaviour

Despite the long history of the reputed use of its tail as a means of disabling prey, the precise technique of deploying the extremely elongated, streamer-like dorsal lobe of its heterocercal tail in this respect seems not to have been adequately observed or described until recently. Aalbers *et al.* (2010), working off southern California between 2007 and 2009, devised a means by which thresher sharks could be photographed in the act of attacking tethered submerged bait targets. Examination of video recordings of 34 such events showed how the elongated caudal fin was deployed to strike at the target.

Further, studies by Oliver *et al.* (2013) of the closely related Pelagic Thresher showed these sharks attacking free-living shoals of Indian Oil Sardines *Sardonella longiceps* off the Philippines. Here the full sequences of tail lashing actions, both horizontal and overhead, were repeatedly captured on video film. Meticulous frame by frame examination was subjected to mathematical analysis enabling the nature and speed of the 'tail slaps' to be calculated.

Attacks consisted of distinct phases. Firstly a rapid lateral lunge toward the prey is converted by the adduction of the pectoral fins into a half forward somersault which lifts the tail in an arc above the body. The sudden splaying of the pectoral fins halts the forward bodily motion, propelling the flexible upper tail lobe forward at force, terminating overhead in an energetic 'slap', the percussive effect of which is capable of stunning prey. The shark then resumes its horizontal poise and returns to collect any prey it has stunned. Tail slaps occur with such force, (the fastest monitored by Oliver *et al.* having a mean speed of 21.82 ms^{-1}) they can cause dissolved gas to diffuse out of the water column to form cavitation bubbles.

Briggs (1854) and his five companions off Scarborough, fortuitously encountered a Common Thresher in the process of hunting, describing the curious behaviour as follows. "It would lie at the surface with the upper part of its head, dorsal fin, estimated to be 2ft [60cm] long, and the upper part of its 'singular' tail out of the water." "After waiting perhaps a couple of minutes a [prey] fish would catch his eye and away he scudded after it with remarkable rapidity, leaving a track of white foam to mark the course he had taken." This behaviour was then repeated. Briggs'

field observation was a rare attempt at describing at least the initial stage of hunting behaviour. Since each attacking lunge created a trail of foam, it may be that Briggs was unknowingly witnessing the results of cavitation caused by the whip-lash of the tail in action.

Acknowledgements

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Freshwater plants and SSSI canals in the East Midlands and North of England 3: Leven Canal and Pocklington Canal

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This article describes part of a study that aimed to record aquatic plants and their abundance in canal SSSIs in the East Midlands and North of England. Two earlier articles dealt with the Leeds & Liverpool Canal and the Huddersfield Narrow Canal (Goulder, 2016) and the Chesterfield, Cromford and Grantham Canals (Goulder, 2017). This third article addresses the Leven Canal and Pocklington Canal. A final article will provide an overview.

The canal SSSIs

Leven Canal

The Leven Canal SSSI (in VC61 South-east Yorkshire) comprises the whole of the canal; it extends for c.5km from Leven (TA106449) on one level westward to the River Hull (TA056449). Navigation is believed to have ceased in the 1930s and the broad-gauge lock to the River Hull was blocked (Duckham, 1973); the canal is largely bordered by flat arable countryside and has always been in private ownership; mostly there is an open-water central channel with abundant submerged and floating-leaved vegetation between margins of emergent plants. A weed-cutting boat was in operation in summer 2015 along the length between Sandholme Bridge near Leven (TA100450) and Far Fox Aqueduct (now demolished and with a pipe to take canal water over the Holderness Drain) c.2km further to the west. There was also evidence of tree clearance along the canal.

Pocklington Canal

The Pocklington Canal SSSI (also in VC61) runs for c.6.8km from Canal Head (SE800473), c.1.5km south-west of Pocklington, to Church Bridge (SE758444) at Melbourne. The canal is broad gauge and its general direction is westward towards its junction with the Yorkshire River Derwent. Also included is an arm c.150m long at Bielby c.4km from Canal Head. The surroundings are deeply rural with both arable land and pasture alongside the canal. Commercial navigation ceased in 1932 and the canal fell into dereliction. Since about 1970 a voluntary society has worked towards the restoration of the canal and by 1987 the c.8.2km of canal between Melbourne and the River Derwent had been reopened to leisure navigation; the SSSI section of canal, however, remained largely derelict except that four of the seven locks have been restored (Anon, 2008). By summer 2013 much of the SSSI canal was occupied by emergent vegetation that had in places colonized the whole width of the channel; elsewhere there was a sinuous central channel of open water as little as 1m wide and <20cm deep, although deeper, more-open water sometimes persisted immediately upstream of locks (Goulder, 2014). In February 2015 there was clearance of emergent vegetation, its roots and rhizomes and a quantity of mud from the SSSI canal over c.0.5km from Top Lock (SE798472) to Silburn Lock and c.1km from Walbut Bridge (SE771442) to Thornton Lock. The aim was to make an open channel at least 4m wide; the work was carried out using amphibious weed cutting/dredging machines (CRT, 2015; Waddington, 2015); it was funded by CRT and Natural England and was intended

to open up the habitat and encourage a diversity of aquatic plants. Some tree clearance was also undertaken.

Recent plant records and change since SSSI notification

Plants were recorded in discrete lengths of the SSSIs (Table 1). In the Leven Canal these were delineated by topographical features and ranged from 0.4-1.4km (mean 1.0km); in the Pocklington Canal they were 0.5km. Only plants on the JNCC (2005) *Common Standards Monitoring Guidance for Canals* checklists for native aquatic plants and non-native aquatic vascular plants were routinely recorded. Recording was by eye but in addition submerged plants in the Pocklington Canal were retrieved by at least 20 grapnel hauls per 0.5km length; plants from the Leven Canal were retrieved for identification using a walking pole extensible to 1.5m with a hook on its end. Recording was mostly from the towing path and emergent plants on the far side were identified using binoculars.

Table 1. Lengths of the Leven Canal and Pocklington Canal SSSIs surveyed

Canal	Lengths surveyed
Leven Canal	1. Southfield Farm (TA105449) westward to Sandholme Bridge (c. 0.4km). 2. From Sandholme Bridge for 1.0km westward. 3. From 1.0km west of Sandholme Bridge to Far Fox Aqueduct (c. 1.0km). 4. Far Fox Aqueduct to Waterloo Bridge (c. 1.0km). 5. Waterloo Bridge to River Hull Lock (c. 1.4km). Recording was in September 2015 Names of locations are from OS 1:25000 Explorer map sheet 295.
Pocklington Canal	1. 0-0.5km downstream (roughly south-west) of Canal Head (SE800473) at Pocklington. 2. 0.5-1km downstream of Canal Head. 3. 0-0.5km upstream of Coat's Bridge (SE785452). 4. 0-0.5km downstream of Coat's Bridge. 5. 0-0.5km upstream of Walbut Bridge (SE771442). 6. 0-0.5km downstream of Walbut Bridge. 7. 0.5-1km downstream of Walbut Bridge. Lengths 1-6 were surveyed in July 2013 and lengths 1,2, 6 & 7 in June 2015. Names of locations are from Anon. (2008) The Pocklington Canal: a Guide to the Canal. Pocklington Canal Amenity Society, York.

The abundance of each plant in each length was described using a truncated 3-point DAFOR scale: i.e. dominant or abundant (d/a), frequent (f) and occasional or rare (o/r). For the Pocklington Canal the DAFOR scores were converted from estimates of whole-channel cover: i.e. d/a=>5% cover, f=0.1-5% cover and o/r=<0.1% cover. To obtain an integrated measure that approximately represented both species richness and abundance in each length, the DAFOR scores were converted to numerical abundance scores (i.e. d/a=3, f=2, o/r=1) and the sum of these abundance scores (∑AS) was calculated. Recording in the Leven Canal was in September 2015 and was along the whole of the SSSI except for c.200m at the extreme east end that was inaccessible. In the Pocklington Canal Lengths 1-6 (Table 1) were recorded in July 2013 and Lengths 1, 2 & 6 were recorded again in June 2015 when Length 7 was also recorded. In all c.52% of the SSSI was surveyed. A few additional records were also made elsewhere in the SSSI in June 2015; that is in the Bielby Arm (SE786440) and adjacent main line of the canal.

Nomenclature follows Stace (2010); scientific names are given in the text only if they do not occur in the tables.

The complete plant records are available as additional electronic material from http://www.ynu.org.uk/naturalist (Leven Canal, Appendix 1.1; Pocklington Canal, Appendix 1.2).

Leven Canal

The Leven Canal had luxuriant aquatic vegetation throughout its length. Much of it had a broad central channel of crystal-clear water, often up to perhaps 1m deep, kept open by weed cutting and removal, and with abundant submerged and floating-leaved vegetation (Plate 2, centre pages). Broad margins of emergent vegetation were also present throughout, becoming more extensive westward beyond where the canal is severed by the demolition of Far Fox Aqueduct.

Seventeen submerged or floating-leaved plants were recorded (Table 2). The mean number of species per length was 8.6 (range 5-14) and the mean ∑AS was 15.8 (13-21) (Table 3). Yellow Water-lily was the most conspicuous plant of the central channel; its underwater "cabbage" leaves were generally abundant and its floating leaves often covered most of the water surface. White Water-lily was also recorded in all five lengths, being dominant/abundant in one length. This plant is often assumed to be introduced when it is found in canals but here it is likely to be native; Crackles (1968) made a persuasive case for this and other aquatic plants in the Leven Canal having their origin in the ancient meres of East Yorkshire (Sheppard, 1957) through which the canal was cut at the beginning of the nineteenth century. The other principal submerged and floating-leaved plants were: Greater Bladderwort was found all along the canal, being dominant/abundant in the three most westerly lengths (Lengths 3-5) and frequent in the other two; Mare's-tail was found in all lengths and dominant/abundant in Lengths 2 & 3; Rigid Hornwort was dominant/abundant in Length 1, where also much biomass of this plant was observed piled up on the bank, hauled out possibly to facilitate angling; Shining Pondweed was dominant along part of Length 3; and Arrowhead was dominant or abundant in Lengths 4 & 5, mainly in its submerged strap-leaved form.

Twenty-one emergent plants were recorded (Table 2). The mean number of species per canal length was 12.8 (range 9-15) while the mean ∑AS was 22.8 (19-26) (Table 3). Common Club-rush tended to colonize the central channel, further out than other marginal emergent vegetation, and was dominant or abundant along the entire canal. Otherwise, especially important components of the extensive marginal vegetation were Common Reed, which was dominant/abundant in Lengths 2-5, and Branched Bur-reed, dominant/abundant in all lengths. Also found throughout the canal and dominant/abundant or frequent in most lengths, were Greater Pond-sedge and Yellow Iris. In addition, non-JNCC checklist wetland plants recorded amongst marginal vegetation included Wild Angelica *Angelica sylvestris*, Purple Small-reed *Calamagrostis canescens*, False Fox-sedge *Carex otrubae*, Great Willowherb *Epilobium hirsutum*, Field Horsetail *Equisetum arvense*, Meadowsweet *Filipendula ulmaria*, Common Marsh-bedstraw *Galium palustre*, Sharp-flowered Rush *Juncus acutiflorus*, Jointed Rush *Juncus articulatus*, Compact Rush *Juncus conglomeratus*, Hard Rush *Juncus inflexus*, Blunt-flowered Rush *Juncus subnodulosus*, Purple-loosestrife *Lythrum salicaria*, Water Figwort *Scrophularia auriculata* and Marsh Woundwort *Stachys palustris*.

Table 2. Aquatic plants recorded and the number of canal lengths in which they were found; Leven Canal and Pocklington Canal SSSIs

	Leven Canal	Pocklington Canal
Survey date	September 2015	July 2013 & June 2015*
Number of canal lengths surveyed	5	7
Submerged and floating-leaved plants		
Ceratophyllum demersum Rigid Hornwort	2(1)	0
Chara/Nitella stonewort	1	2
Elodea canadensis Canadian Waterweed	3	6(2)
Elodea nuttallii Nuttall's Waterweed	0	3(1)
Hippuris vulgaris Mare's-tail	5(2)	0
Hottonia palustris Water-violet	1	0
Lemna minor Common Duckweed	3¶	7(2)
Lemna trisulca Ivy-leaved Duckweed	2	6(2)
Myriophyllum verticillatum Whorled Water-milfoil	1	0
Nuphar lutea Yellow Water-lily	5(5)	5(1)
Nymphaea alba White Water-lily	5(1)	0
Potamogeton crispus Curled Pondweed	0	2(1)
Potamogeton lucens Shining Pondweed	2(1)	1
Potamogeton natans Broad-leaved Pondweed	0	2
Potamogeton pectinatus Fennel Pondweed	1	1
Ranunculus circinatus Fan-leaved Water-crowfoot	1	2(1)
Riccia fluitans Floating Crystalwort	2	0
Sagittaria sagittifolia Arrowhead	3(2)	0
Sparganium emersum Unbranched Bur-reed	1	4
Utricularia vulgaris Greater Bladderwort	5(3)	0
Emergent plants		
Agrostis stolonifera Creeping Bent	3	4
Alisma plantago-aquatica Water-plantain	0	1
Berula erecta Lesser Water-parsnip	1	4
Butomus umbellatus Flowering-rush	1	3(2)
Carex acutiformis Lesser Pond-sedge	0	4
Carex elata Tufted-sedge	5	0
Carex riparia Greater Pond-sedge	5(1)	3
Carex rostrata Bottle Sedge	1	0
Equisetum fluviatile Water Horsetail	2	0
Glyceria maxima Reed Sweet-grass	4	7(6)
Iris pseudacorus Yellow Iris	5(2)	6
Juncus effusus Soft-rush	4	0
Mentha aquatica Water Mint	5	0
Nasturtium officinale Water-cress	0	2
Oenanthe fistulosa Tubular Water-dropwort	1	0
Persicaria amphibia Amphibious Bistort	4	3
Phalaris arundinacea Reed Canary-grass	3	4

Phragmites australis Common Reed	5(4)	5(5)
Ranunculus sceleratus Celery-leaved Buttercup	0	1
Rumex hydrolapathum Water Dock	1	0
Schoenoplectus lacustris Common Club-rush	5(5)	0
Sium latifolium Greater Water-parsnip	1	0
Solanum dulcamara Bittersweet	2	3
Sparganium erectum Branched Bur-reed	5(5)	5
Typha latifolia Bulrush	1	5
Veronica beccabunga Brooklime	0	1

Values are the number of canal lengths in which each plant was recorded (infill indicates plants that were dominant or abundant in at least one length; values in brackets are the number of lengths in which these plants were recorded as dominant or abundant).
*In the Pocklington Canal Lengths 1-6 were recorded in 2013 and Lengths 1, 2, 6 & 7 in 2015; if a plant was dominant/abundant in either year it was counted as such in this table. In addition *Apium nodiflorum* Fool's-water-cress and *Equisetum palustre* Marsh Horsetail were recorded in the Bielby Arm and adjacent main line of the canal in June 2015 but not otherwise in the SSSI.
¶*Lemna minuta* may also have been present.

Table 3. Number of species and sum of abundance scores for SSSI canal lengths.
Leven Canal, September 2015

	Canal length					
	1	2	3	4	5	Mean
Number of species						
Submerged and floating-leaved plants	11	14	5	7	6	8.6
Emergent plants	13	15	15	9	12	12.8
All species	24	29	20	16	18	21.4
∑abundance scores						
Submerged and floating-leaved plants	16	21	13	16	13	15.8
Emergent plants	22	23	26	19	24	22.8
All species	38	44	39	35	37	38.6

Pocklington Canal, July 2013 and June 2015

	Canal length							
	1	2	3	4	5	6	7	Mean
Number of species								
Submerged and floating-leaved plants	5(5)	4(4)	7	8	6	5(4)	(6)	5.8(4.8)
Emergent plants	5(6)	3(4)	8	9	9	12(10)	(11)	7.7(7.8)
All species	10(11)	7(8)	15	17	15	17(14)	(17)	13.5(12.5)
∑ abundance scores								
Submerged and floating-leaved plants	11(7)	8(9)	12	15	12	10(9)	(13)	11.3(9.5)
Emergent plants	7(8)	5(7)	14	17	17	19(17)	(21)	13.2(13.3)
All species	18(15)	13(16)	26	32	29	29(26)	(34)	24.5(22.8)

Results in brackets are for June 2015

Seven of the plants found in the Leven Canal feature on the *South-east Yorkshire (VC61) Rare Plant Register* (Middleton & Cook, 2014). Amongst submerged plants the most abundant was Greater Bladderwort, which was frequent or dominant/abundant throughout the canal, while Whorled Water-milfoil and Water-violet were represented only by floating detached shoots, the former being identifiable by its possession of a turion (a bud with the potential to over-winter and facilitate vegetative reproduction). Emergent plants featured were Tufted-sedge, which occurred throughout the canal, Bottle Sedge which was sparse in Length 3 and Tubular Water-dropwort and Greater Water-parsnip, the last two only as single individuals . Other plants of conservation interest were the aquatic liverwort Floating Crystalwort which was found in Lengths 1 & 2 and occasional individuals of Water Dock amongst marginal vegetation in Length 5.

The Leven Canal SSSI citation of 1962, revised 1986 (Natural England, 2016), drew attention to the belief of Crackles (*loc. cit.*) that the canal flora reflects that of lost East Yorkshire wetlands; a wide range of aquatic plants was said to be present but relatively few of them were named. Submerged and floating-leaved plants that were specifically identified were Yellow Water-lily, White Water-lily, Shining Pondweed, Broad-leaved Pondweed and Arrowhead. There were large stands of Common Reed and Common Club-rush; other named emergent JNCC checklist plants were Flowering-rush, Bottle Sedge, Water Horsetail and Tubular Water-dropwort. Further information is available from 1950-1956 (Crackles, *loc. cit.*), 1987 (Kendall, 1987), 1997 (Anon., 1997a) and 2005 (Goulder, 2006).

The SSSI citation and the publications and reports cited above indicate that there was an abundant and diverse flora of submerged and floating-leaved plants from the 1950s into the beginning of the 21st century. Crackles (*loc. cit.*) mentions five Potamogetons: Red, Curled, Flat-stalked, Shining and Broad-leaved Pondweeds. Of these all but Curled Pondweed were frequent, common or abundant. Also there were extensive beds of Spiked and Whorled Water-milfoils while Yellow and White Water-lilies were frequent and widespread, and also recorded were Lesser Marshwort, Canadian Waterweed, Mare's-tail and Common and Ivy-leaved Duckweeds. Additional submerged/floating-leaved plants recorded in 1987 included water-starwort, Rigid Hornwort, Nuttall's Waterweed, Water-violet, Fennel Pondweed, Fan-leaved Water-crowfoot, Unbranched Bur-reed, Greater Bladderwort and Floating Crystalwort (Kendall, *loc. cit.*) while Least Duckweed was an addition in 1997 (Anon., 1997a).

It is very evident that the Leven Canal continued to host a luxuriant and species-rich flora of submerged and floating-leaved plants in 2015 (Table 2). Yellow and White Water-lilies continued to be widespread and conspicuous and a number of submerged plants were dominant or abundant in some lengths, notably Rigid Hornwort, Mare's-tail, Shining Pondweed, Arrowhead and Greater Bladderwort. Furthermore some of the persisting submerged plants are rare or scarce in VC61, i.e. Water-violet, Whorled Water-milfoil and Greater Bladderwort (Middleton & Cook, *loc. cit.*). There have, however, been some notable changes shown by submerged and floating-leaved plants. In 2015 there were no longer the substantial beds of Spiked and Whorled Water-milfoils and Broad-leaved Pondweed that Crackles (*loc. cit.*) described as being found in the 1950s. Eight submerged plants formerly found in the canal were not recorded in 2015 (Table 4). These included three pondweeds: Red Pondweed, possibly last recorded in the canal

in the 1950s (Crackles, *loc. cit.*) and now thought to be regionally extinct (Middleton & Cook, *loc. cit.*); Flat-stalked Pondweed, nationally scarce but probably regionally secure (Middleton & Cook, *loc. cit.*) and known to have been in the canal as recently as 2005 (Goulder, 2006); Broad-leaved Pondweed which is widespread in East Yorkshire. Also not recorded in 2015 was Lesser Marshwort which is regionally rare (Middleton & Cook, *loc. cit.*).

There was extensive emergent marginal vegetation in the 1950s and 1960s (Crackles, *loc. cit.*, Natural England, *loc. cit.*); there were large stands of Reed Sweet-grass, Common Reed and Common Club-rush and also notable amongst JNCC checklist plants were Bottle Sedge, Water Horsetail and Tubular Water-dropwort. A wide range of additional checklist emergent plants that were recorded in 1987 included Creeping Bent, Water-plantain, Lesser Water-parsnip, Flowering-rush, Marsh-marigold, Slender Tufted-sedge, Tufted Sedge, Greater Pond-sedge, Bladder-sedge, Yellow Iris, Soft-rush, Water Mint, Water Forget-me-not, Water-cress, Amphibious Bistort, Reed Canary-grass, Celery-leaved Buttercup, Greater Water-parsnip, Bittersweet, Branched Bur-reed and Brooklime (Kendall, *loc. cit.*). Additional in 1997 were Narrow-leaved Water-plantain, Fool's-water-cress and Water-pepper (Anon., 1997a).

Extensive and species-rich emergent vegetation was still there in 2015 (Table 2); Common Reed and Common Club-rush continued to be dominant along much of the canal although comparison of the 2015 results with Crackles' account for the 1950s (Crackles, *loc. cit.*) suggests that there has been increase by Branched Bur-reed and possibly decrease of Reed Sweet-grass. It is encouraging that four emergent plants that feature on the rare plant register for VC61 (Middleton & Cook, 2014) and were in the canal in 1987 (Kendall, *loc. cit.*) were still there in 2015; that is Tufted Sedge, Bottle Sedge, Tubular Water-dropwort and Greater Water-parsnip. Of these, however, all except Tufted Sedge were extremely scarce. There were 11 previously-recorded emergent plants that were not found in 2015 (Table 4). Some of these are widespread elsewhere in East Yorkshire but some of the apparent losses are of concern; Bladder-sedge and Narrow-leaved Water-plantain are both regionally scarce, although the latter was recorded in the Leven Canal as recently as 2007 (Middleton & Cook, *loc. cit.*).

Pocklington Canal

Taking together the 2013 and 2015 surveys, 12 submerged and floating-leaved plants and 19 emergent plants were recorded in the Pocklington Canal SSSI (Table 2). The aquatic vegetation in the SSSI in July 2013 has been described by Goulder (2014). Then the mean number of submerged and floating-leaved plants per 0.5km was 5.8 (range 4-8) while that for emergent plants was 7.7 (3-12); mean ∑AS per 0.5km for submerged/floating-leaved plants was 11.3 (8-15) and that for emergent plants 13.2 (5-19) (Table 3). Minor discrepancies between these values and those in the 2014 paper are because a slightly different checklist was used. In the six 0.5km lengths that were surveyed in 2013 (Table 1), submerged and floating-leaved plants were largely subservient to abundant emergent vegetation. There were however some notable exceptions. (1) About 200m of canal in Length 1 from Canal Head to Top Lock at Pocklington is maintained as an amenity area (Anon, 2008), with fishing stages and picnic tables, and has been periodically dredged. Although heavily silted, this part of the canal was largely open water with abundant submerged plants; Curled Pondweed was dominant/abundant while Canadian Waterweed, Common Duckweed, Fennel Pondweed and Fan-leaved Water-crowfoot

were all recorded as frequent. (2) Immediately upstream of the restored Walbut Lock (Length 5) there was a central channel of deep water with dominant/abundant Yellow Water-lily; other submerged/floating-leaved plants at this location included Canadian Waterweed, Broad-leaved Pondweed and Unbranched Bur-reed. (3) Immediately downstream of the restored Coat's Lock, between the lock and Coat's Bridge (Length 3), by-flow water re-entered the channel and there was deep flowing water where a submerged/floating-leaved community included stonewort, Canadian and Nuttall's Waterweeds, Common and Ivy-leaved Duckweeds, Yellow Water-lily and Unbranched Bur-reed.

Along much of the canal in 2013, however, the whole width of the channel was occupied by emergent vegetation (Plate 2, centre pages); elsewhere there was little open-water and this was sometimes reduced to a narrow sinuous channel, in places <1m wide and no more than 20cm deep, between extensive stands of emergent plants. The remaining open water tended to have inconspicuous submerged and floating-leaved vegetation although stonewort, Canadian and Nuttall's Waterweeds, Common and Ivy-leaved Duckweeds, Yellow Water-lily, Curled Pondweed, Fan-leaved Water-crowfoot and Unbranched Bur-reed were each recorded as dominant/abundant or frequent in at least one 0.5km length (Table 2). The dominant emergent plants were Reed Sweet-grass and Common Reed, the latter being important along Lengths 3-6. No other emergent plants were recorded as dominant or abundant in 2013 although Lesser Water-parsnip, Flowering-rush, Lesser Pond-sedge, Yellow Iris, Amphibious Bistort, Reed Canary-grass, Branched Bur-reed and Bulrush were each frequent in one or more 0.5km lengths.

Recording of Lengths 1 & 2 and 6 & 7 in June 2015 followed partial clearance of emergent plants, silt and mud in February 2015. For these four lengths in 2015 the mean number of submerged and floating-leaved plants was 4.8 (range 4-6) and for emergent plants 7.8 (4-11). Mean ∑AS was 9.5 (7-13) for submerged/floating-leaved plants and 13.3 (7-21) for emergent plants (Table 3). In Length 1 c.300m of canal lies downstream of Top Lock and there the recent dredging/ weed clearance had left a somewhat sinuous central open channel of width 3-5m (Plate 2, centre pages). On each side of this remained tall emergent vegetation mostly comprising Reed Sweet-grass but with scattered Bulrush and the non-JNCC-checklist plant Great Willowherb; this merged into terrestrial vegetation at the soft but steeply-sloping canal margin. The central channel had a silty bed and shallow (<50cm depth) clear water with a discernible flow; there had been no colonization by submerged plants. The recently-cleared central channel continued along the initial c.150m of Length 2 to the unrestored Silburn Lock, broadening immediately upstream of the lock. There had been no recent clearance downstream of the lock and the canal and its vegetation remained much as it had been in 2013. The initially-narrow, sinuous, shallow central channel between wide stands of Reed Sweet-grass soon gave way to a broader 4-8m wide open channel of transparent water, in places perhaps 50-80cm deep, while the marginal stands narrowed to 2-5m width. There was some tree shading but nevertheless there were substantial beds of submerged plants in the open channel; Nuttall's Waterweed and Fan-leaved Water-crowfoot were both recorded as dominant/abundant.

There had also been clearance of Length 6 in February 2015. By June there was a central open channel largely 3-4m wide with shallow water <20cm deep between bordering stands of

Common Reed or Reed, Sweet-grass. There had been some colonization of the newly opened channel by Canadian Waterweed which was recorded as frequent, and by notable emergent stands of Flowering-rush, which was recorded as dominant/abundant in 2015, having been only occasional or rare in 2013.

Length 7, which extended westwards to within c.50m of the restored Thornton Lock, had also been cleared in February 2015; the plants in this length, however, were not surveyed in 2013. This length in summer 2015 also had an open central channel up to c.5m wide which had shallow water, <30cm and often only 5-10cm deep, with a silt bed between wide marginal stands of initially Reed Sweet-grass and then Common Reed. There was also evidence of some tree removal. The newly opened-up channel was rapidly being colonized by submerged and floating-leaved plants; Canadian Waterweed, Ivy-leaved Duckweed, Yellow Water-lily and Shining and Broad-leaved Pondweeds were recorded as frequent and Common Duckweed as dominant/abundant. Emergent plants were also colonizing the channel, especially Flowering-rush which was recorded as dominant/abundant and Lesser Water-parsnip which was frequent. Some plants of Shining and Broad-leaved Pondweeds were stranded out-of-water on apparently recently exposed silt banks alongside the channel. It appeared that at the time of survey in June 2015 there was a problem with the gates of Thornton Lock that had caused an unusually low water level.

None of the aquatic plants recorded in 2013 or 2015 feature on the *South-east Yorkshire (VC61) Rare Plant Register*. Non-checklist wetland plants included Wild Angelica, Hart's-tongue *Asplenium scolopendrium*, Great Willowherb, Field Horsetail, Meadowsweet, Indian Balsam *Impatiens glandulifera*, Jointed Rush, Hard Rush, Water Figwort, Marsh Woundwort and Common Valerian *Valeriana officinalis*.

The 1987 SSSI citation (Natural England, *loc. cit.*) described the Pocklington Canal as one of England's most valuable canal sites; its aquatic plants and fringing emergent swamp and fen communities were of notable importance. Submerged/floating-leaved plants included six pondweeds, with the nationally-rare Flat-stalked Pondweed amongst them, and the also nationally-rare Soft Hornwort. Locally-rare species included Blunt-fruited Water-starwort, Fat Duckweed and Fan-leaved Water-crowfoot. Emergent vegetation included significant stands of Reed Sweet-grass and Common Reed; locally rare emergent plants included Narrow-leaved and Lesser Water-plantains and Flowering-rush. The results of plant surveys undertaken in 1986 (Tolhurst, 1987), 1990 (Head, 1991), 1996 (Anon., 1997b), 2002 (Goulder, 2003) and 2007 (Broughton, 2008) and those of the 2013 survey (Goulder, 2014) show the progression of a hydro-sere; the emergent vegetation, largely Reed Sweet-grass and Common Reed increased, in places to occupy the entire width of the channel, while submerged plants and less-robust emergent plants, were out-competed and lost.

About 17 submerged and floating-leaved plants that were recorded in the SSSI at some time between 1986 and 2007 were not found in the 2013 or 2015 surveys (Table 4). In 2013 and 2015 together only c.52% of the SSSI was surveyed hence it is likely that some plants were missed. However, a survey of the entire SSSI in 2007 (Broughton, *loc. cit.*) failed to find at least 12 submerged/floating-leaved plants that had been recorded between 1986 and 2002, thus there

certainly appear to have been substantial losses of submerged/floating-leaved plants since notification of the SSSI. Several of these apparently lost plants (Table 4) feature as noteworthy in the 1987 SSSI citation and/or are sufficiently rare or scarce nationally or locally to feature on the *South-east Yorkshire (VC61) Rare Plant Register* (Middleton & Cook, *loc. cit.*): i.e. Blunt-fruited and Various-leaved Water-starworts, Soft Hornwort, Opposite-leaved Pondweed, Fat Duckweed, Small and Flat-stalked Pondweeds and Common Water-crowfoot.

The vigorous growth of principally Reed Sweet-grass and Common Reed also appears to have been accompanied by the loss of several, perhaps less competitive, emergent plants (Table 4). Some of these may have been missed in 2013/2015 because not all the SSSI was surveyed; nevertheless there were six JNCC-checklist emergent species, previously reported in the SSSI, that were found neither by the 2007 survey of the entire SSSI (Broughton, *loc. cit.*) nor by the 2013/2015 survey (Table 4). These were Lesser Water-plantain, Common Spike-rush, Water Horsetail, Soft-rush, Creeping Forget-me-not and Blue Water-speedwell of which Lesser Water-plantain is regionally rare (Middleton & Cook, *loc. cit.*).

In the context of apparent losses from the SSSI it is encouraging to note that many of the plants that were formerly recorded in the SSSI but were not found in the 2013/15 surveys (Table 4) were still present in 2013 in the navigable part of the canal, beyond the SSSI, between Melbourne and the River Derwent where open water has been maintained between beds of emergent marginal vegetation (Goulder, *loc.cit.)*. These included the submerged/floating-leaved plants Rigid Hornwort, Flat-stalked Pondweed and Arrowhead and the emergent plants Marsh-marigold, Common Spike-rush, Soft-rush, Water Mint and Water Forget-me-not.

Table 4. Aquatic plants apparently lost from canal SSSIs since notification:

Leven Canal

JNCC checklist plants recorded at SSSI notification and to 2005 but not in 2015	
Submerged and floating-leaved plants	**Emergent plants**
Apium inundatum Lesser Marshwort[2,3] *Callitriche* sp.water starwort[3] *Elodea nuttallii* Nuttall's Waterweed[3,5] *Myriopyllum spicatum* Spiked Water-milfoil[2,3,4] *Potamogeton alpinus* Red Pondweed[2] *Potamogeton crispus* Curled Pondweed[2,3,4,5] *Potamogeton friesii* Flat-stalked Pondweed[2,3,4,5] *Potamogeton natans* Broad-leaved Pondweed[1,2,3,4] n of taxa=8	*Alisma plantago-aquatica* Water-plantain[2,3,4,5] *Alisma lanceolatum* Narrow-leaved Water-plantain[4] *Apium nodiflorum* Fool's-water-cress[4] *Caltha palustris* Marsh-marigold[3,4,5] *Carex acuta* Slender Tufted-sedge[3] *Carex vesicaria* Bladder-sedge[3] *Myosotis scorpioides* Water Forget-me-not[3,4,5] *Nasturtium officinale* Water-cress[3,4] *Persicaria hydropiper* Water-pepper[4] *Ranunculus sceleratus* Celery-leaved Buttercup[3] *Veronica beccabunga* Brooklime[3,4] n of taxa=11

Reported in [1]SSSI citation 1962 (revised 1986) (Natural England, *loc. cit.*); [2]1950-1956 (Crackles, *loc. cit.*); [3]1987 (Kendall, *loc. cit.*); [4]1997 (Anon., 1997a); [5]2005 (Goulder, 2006).

Pocklington Canal

JNCC checklist plants recorded at SSSI notification and to 2007 but not in 2013 or 2015	
Submerged and floating-leaved plants	**Emergent plants**
Azolla filiculoides Water Fern[3] *Callitriche obtusangula* Blunt-fruited Water-starwort[1,2] *Callitriche platycarpa* Various-leaved Water-starwort[2] *Callitriche stagnalis* Common Water-starwort[2] *Callitriche* sp. water-starwort[3,4,5] *Ceratophyllum demersum* Rigid Hornwort[2,3,4,6] *Ceratophyllum submersum* Soft Hornwort[1,2,3] *Fontinalis antipyretica* Greater Water-moss[2,3,4,5,6] *Groenlandia densa* Opposite-leaved Pondweed[2,3,4] *Lemna gibba* Fat Duckweed[1,2,3,4] *Myriophyllum spicatum* Spiked Water-milfoil[2] *Potamogeton berchtoldii* Small Pondweed[2,4,5] *Potamogeton friesii* Flat-stalked Pondweed[1,2,3,4,6] *Potamogeton pusillus* Lesser Pondweed[3] *Ranunculus aquatilis* agg. Common Water-crowfoot[2] *Sagittaria sagittifolia* Arrowhead[6] *Zannichellia palustris* Horned Pondweed[2,3,4] n of taxa=17	*Alisma lanceolatum* Narrow-leaved Water-plantain[1,2,3,4,6] *Baldellia ranunculoides* Lesser Water-plantain[1,2,3] *Caltha palustris* Marsh-marigold[2,6] Eleocharis palustris Common Spike-rush[2,3] *Equisetum fluviatile* Water Horsetail[2] *Juncus effusus* Soft-rush[2,5] *Mentha aquatica* Water-Mint[2,3,4,5,6] *Myosotis scorpioides* Water Forget-me-not[2,4,5,6] *Myosotis secunda* Creeping Forget-me-not[2] *Rumex hydrolapathum* Water Dock[6] *Veronica anagallis-aquatica* Blue Water-speedwell[2] n of taxa=11

Reported in [1]SSSI citation 1987 (Natural England, *loc. cit.*); [2]1986 (Tolhurst, *loc. cit.*); [3]1990 (Head, *loc. cit.*); [4]1996 (Anon., 1997b); [5]2002 (Goulder, 2003); [6]2007 (Broughton, *loc. cit.*).

Conclusions

This article describes work on two canals that formed part of a wider study on seven canal SSSIs. Discussion of these two canals will be integrated into a final article that will give an overview of the seven canals but in the meantime some interim conclusions can be made.

The Leven Canal and Pocklington Canal SSSIs have a shared history of having been disused since the 1930s and they both had abundant aquatic vegetation in 2013 and/or 2015. They differed, however, in that the Leven Canal tended to have a wider and deeper open water channel and more widespread and abundant submerged and floating-leaved vegetation. Furthermore 17 submerged/floating-leaved plants were recorded in the Leven Canal compared with 12 in the Pocklington Canal (Table 2). It is likely that weed cutting has encouraged diversity in the Leven Canal. Both canals had extensive emergent vegetation although this tended to occupy more of the channel in the Pocklington Canal; the number of emergent plants recorded was similar in the two canals; 21 in the Leven Canal and 19 in the Pocklington Canal (Table 2).

Scarce and uncommon plants were a feature of both canals when they were notified as SSSI. A good number of these have survived in the Leven Canal. In 2015 Water-violet, Whorled Water-milfoil, Greater Bladderwort, Tubular Water-dropwort and Greater Water-parsnip, for example, were still there (Table 2). In contrast, in the Pocklington Canal SSSI only two (Fan-leaved Water-crowfoot and Flowering-rush) of the nationally or locally rare plants mentioned by the 1987 notification (Natural England, *loc. cit.*) were still to be found and neither of these are currently threatened in VC61 (Middleton & Cook, *loc. cit.*).

There seem to have been fewer losses of submerged and floating-leaved plants from the Leven Canal. Eight have apparently been lost from the Leven Canal, including four pondweeds. In

contrast 17 of these plants seem to have been lost from the Pocklington Canal (Table 4). It is likely that shallow water and extensive development of emergent vegetation, dominated by Reed Sweet-grass and Common Reed, to the extent that often more-or-less the whole canal width has been colonized, is responsible for the substantial losses of submerged and floating-leaved plants in the Pocklington Canal. It is encouraging, therefore, that in June 2015, following dredging/vegetation clearance in February, there had, for example in length 7, already been colonization of the cleared channel by a diversity of submerged plants that included Canadian Waterweed, Common and Ivy-leaved Duckweeds, Yellow Water-lily and Shining and Broad-leaved Pondweeds. It is possible that the vegetation clearance/dredging operation spread plant propagules around and so encouraged rapid colonization.

Acknowledgements

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YNU Notice: 2015 Yorkshire Bird Report – Writers Needed

The 2013 Yorkshire Bird Report has now been delivered to YNU members. Whilst published much later than originally planned, it nevertheless reflects the sterling efforts of a large team of dedicated volunteers. We would like to thank the writers, editors, photographers, illustrators, sponsors and of course all the observers who contributed bird records to produce this excellent report. We are also grateful to members for their patience and assure you that work on the 2014 Bird Report is well underway and we are aiming for publication later this year.

We are now seeking ten writers to help compile species accounts for the 2015 Yorkshire Bird Report. Work will be starting soon with an expected deadline of November 2017. Guidance and support will be provided. You do not need to be an ornithological expert - a good standard of literacy and the ability to précis large amounts of information are key. We usually suggest that new writers tackle ten species, but it is possible to do more or fewer if you prefer. If you are interested in being part of the team, compiling this fantastic report and would like more information about what is involved, please contact Geoff Dobbs on geoffdobbs@aol.com. We will be very grateful to hear from you!

Four-and-twenty Blackbirds: a margin note in the Brodworth Estate game book

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The Brodsworth Estate (SE5007) is situated on the Magnesian Limestone ridge five miles north west of Doncaster, South Yorkshire. During its ownership under the Thellusson family, the estate was managed by a staff of keepers in a series of shooting beats, records of game being meticulously recorded in a series of game books covering the period 1862 to 1959 (Doncaster MBC Archives Ref. DD/BROD/5/1-13).

A margin note in the game book for the shooting season September 1900 to January 1901 gives the following curious entries:

"12 January. A.T. shot 14 Blackbirds [*Turdus merula*] (had to kill 12 for a bet)".
The game book recorded that the activity took place on the shooting beat referred to as the 'Park' and that 24 Rabbits *Oryctolagus cuniculus* were also killed.

"16 January. C.T. also killed 12 for a bet".
On this day, shooting took place in the wetland beat referred to as the 'Brook', where 2 Duck *Anas platyrhynchos*, 2 Plovers *Vanellus vanellus*, 2 Pheasants *Phasianus colchicus*, 1 Partridge *Perdix perdix*, 3 Snipe *Gallinago gallinago* and 2 Rabbits were also killed.

Charles Sabine Augustus Thellusson (1822-1885), who inherited the estate in 1859, had four sons who inherited the estate in succession after his death. The initials of the two gambling sportsmen, 'A.T.' and 'C.T.', refer to the sons Augustus Thellusson (1863-1931) and his brother Charles Thellusson (1860-1919).

Today the wanton destruction of these passerines for such a callously trivial reason would be deemed reprehensible though whether there was a culinary outcome, giving a poetic finalé to the event, is not recorded; even the resourceful Mrs Beeton (1861) eschews providing a recipe for blackbirds. However, the fact that the incident was documented and that the document has survived provides an interesting biological record. Influxes of large numbers of blackbirds migrate to Yorkshire in autumn, ringing evidence showing their origins in Scandinavia and northern Europe, though most pass through to France and Spain (Mather, 1986).

During the winter months, blackbirds can roost communally in large numbers, notable examples being 500 in rhododendrons at Creskeld Park, 565 going to roost at Farnley Park and up to 3,000 at Otley Plantation, all near Leeds (Mather, *loc.cit.*). Winter roosts of this magnitude have not been known in the Doncaster region though in February 1968 44 fed together on a ploughed field at Hatfield Moors, large numbers (unspecified) assembled at sewage works during the severe winter of 1962-63 and roosts of 30-70 have been reported at suitable sites (Rhodes 1988). The 24 + 2 blackbirds killed by the Thelluson brothers suggest that during January 1901 a substantial and hitherto unknown roosting population had evidently established in the game

and ornamental shrubberies at Brodsworth Park.

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Green Teens to Greybeards – an engagement conundrum

Zach Haynes (age 13)

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Last weekend, on the 8th April 2017, I went to the Yorkshire Naturalists' Union's annual Conference and I must say it was a great day. I was very grateful to be asked to be an exhibitor with my blog 'A Year of Nature' (see back cover) and I was the youngest person there, which gave me a wonderful opportunity to put forward my thoughts.

In the morning, the talks were mainly covering how to inspire young naturalists and other people to get involved with nature and natural history societies. The first two were by the two Rogers who were there. The keynote talk was by Roger Morris (see p121), who discussed how to get kids into natural history, and also the problems with websites such as iSpot and iRecord. These websites can help people learn to identify at least the more common species for themselves, maybe stretch them to identify the rarer ones too and realise how to photograph things to aid identification. However, these websites are difficult to manage as they take a lot of experts' time to verify identifications, and most insects, plants and fungi cannot be identified by a single photograph. The next talk was by Roger Key, an entomologist who does a lot of work with younger people and getting them into bugs and other insects. He was suggesting different ways to get not only the younger children into nature, but also teens, young adults, and older people. He also talked a bit about workshops as a way to "reach out to inspire new generations". The main topic was how the YNU 'Greybeards' (Roger's word) could communicate with the general public to create new 'green teens' (my words) that will get involved with groups like YNU so that they can continue in the future.

After this came Derek Whiteley's talk where he explained about a "survival manual for natural history societies" using examples from Sorby Natural History Society and their recording area of 'Sorbyshire'. From Whitby Naturalists' Club came Wendy English who was talking about how to communicate with members of their society and beyond, again this would include all ages, and how to inspire them to get into nature, or how to do it even more by getting involved with things such as recording.

Then came the discussions, this is where everybody at the conference split up into six small groups to talk about what they'd heard in this first session, For Naturalists. So my group (led by Sarah West) talked mainly about how to get younger people into nature. Several things were suggested such as using YouTube and other social media platforms to advertise the YNU and other organisations, but I think the one that would work the best is to ask the younger

people what they like and don't like about nature, and then see what would inspire them to get into nature, instead of trying to predict it ourselves. One thing I wondered about to draw in more teens, was to combine nature with something that appealed to my generation, such as technology, that might be a good starting point. So it was about maybe learning a new skill and getting experience in identifying species, filming, time-lapsing, photographing, recording, that sort of thing. There have always been workshops at reserves for small children to build a bug hotel, or paint a bird house, but maybe workshops to put together a YouTube video for example might appeal to older kids. YNU at least needs to consider advertising itself on sites like YouTube if it wants to reach young people.

Anyway, after this came the second session, For Nature. This consisted of four talks about how we can help wildlife itself while we can, and what future generations can do to help. The first talk of the afternoon was led by Dave Chesmore and Andy Grayson who were talking about the Long-term Monitoring of a Habitat Creation Project, specifically, they were talking about Three Hagges Wood Meadow, a meadow that was created a few years ago near York from a bare field. It covered what there was at the Meadow, such as a pond and a bee hotel, and told us how these things would work. Dave and Andy also covered what they think will happen in the future, and if this could be recreated in other places, and how it could happen. Three Hagges Wood Meadow has already been used as an 'outdoor classroom' and has had schools come to it to learn about the outside world. I've visited the wood and had a lovely time exploring it and watched Broad-bodied Chasers emerge from their nymphs, it's incredible how much life there is there now. Next, was Phillip Whelpdale of the Yorkshire Wildlife Trust who was talking about data and the different variants of 'knowns and unknowns' in the environment. These were:

- Known Knowns – Things we know we know – Such as there is a badger sett on a reserve
- Unknown Knowns – Things we don't know we know – Research about badgers that hasn't been shared
- Known Unknowns – Things we know we don't know – Possibly where the badger sett is
- Unknown Unknowns – Things we don't know we don't know – We don't know!

He covered more of these, and it well and truly confused most of us, but it was a great talk to stretch your brain! Roger Key came up with another version in our discussion later too, things we think we know but we don't actually know because we've got it wrong – I think that would make that an Unknown Known Unknown..!

The next talk was by Mark Wills and Clare Langrick from the North and East Yorkshire Ecological Data Centre who were talking to us about "biological records for better local decisions". I was really interested to hear about the Turtle Dove project and I'll be trying to get along to some of the sites they mentioned as I've not seen one in Yorkshire yet. Helen Kirk from Thorne and Hatfield Moors Conservation Forum told us in her talk about a little bit of Yorkshire, Inkle Moor, that had basically been left alone for centuries. A lot of people thought it was a "grotty little site" but when they surveyed it they found it was rich in species including one that had not been recorded in the UK before.

The second discussion session was great too. We talked about how to try and get more people recording nature and how to get more people able to verify identifications with systems like iSpot and iRecord to help stop experts being tied to their computers and not able to get out into the field. It's a tricky one but basically more people are needed. Maybe younger people need to

be trained in and trusted with some of the easier groups and identifications to start with so the experts can just deal with the trickier ones. Hopefully the younger people will get more expert in time and be able to help more.

The final few talks were great too, they were short presentations about lots of groups or projects that are taking place in Yorkshire. There are lots that I will try to get involved with like Sharon Flint's riverfly recording project and The Wild Watch in Nidderdale which I've been asked to be involved with.

So it was a great day. I learnt such a lot and met lots of great people. I've always found naturalists to be very kind and supportive of me and the YNU conference day only reinforced that. It is a shame that more young people don't get nature, or aren't 'into it' as it would have been great to have a few more people my age along, but it is good to know that we are being thought about and that natural history societies want us to be involved. Children need to experience how wonderful and fascinating nature is, and somehow without scaring them how important it is to protect it so that more people will come forward in future to help do that. I'm not sure we came up with all the answers that day but I certainly want to keep helping.

Thanks for inviting me and thanks to everyone that came and showed an interest in my project.

A Year of my Nature Hunting – www.yearofnature.blogspot.co.uk

Field Note: Tongues of Fire rust in Upper Teesdale (VC65)

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Whilst walking alongside the River Tees near High Force in mid May 2017, we came across a strange orange fungus on the branches of several Juniper *Juniperus communis* bushes. It was unlike any fungus that we were familiar with, but had similarities to the Clavaria group.

No comparable species were found in the reasonably comprehensive identification books we had, so we used Google, Wikipedia and iSpot to narrow our find down to the unusual rust fungus *Gymnosporangium clavariiforme*, which on some websites was also labelled the Tongues of Fire Rust. The reason for this name can be seen in the photograph on the front cover: the orange hanging 'tongues' are spore-bearing tubes.

In common with other rust fungi, *G. clavariiforme* has two alternating hosts, in this case Juniper and Hawthorn *Crataegus monogyna*. It is responsible for forming galls on haws bearing whitish protuberances which produce the spores that eventually infect Juniper. The fungus apparently causes little damage to this host (unlike the *Phytophthora* disease which had killed several Junipers in the area) but can cause a severe reduction in the number of fruits produced by infected Hawthorns.

A new paradigm in biological recording

The keynote presentation at the 2017 YNU Conference

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Introduction

Biological recording has evolved far beyond what Gilbert White (1720 – 1793) and Carl Linnaeus (1707 – 1778) might ever have envisaged. It has done so in a series of stages, often aided by technological advances. By far the biggest leap forward has been made in the past ten years as a result of digital photography and the internet. It is worth reflecting on that journey to put some of today's challenges into context.

By the 19th century there was a remarkable hunger for knowledge, with many working people making strenuous efforts to improve themselves. Interest in the natural world blossomed with the work of taxonomists such as Gideon Mantell and Richard Owen. Meanwhile, the great battles of Darwin and Huxley on one side, and Bishop Wilberforce on the other, over the theory of evolution, put natural sciences firmly in the public eye. Local natural history and microscopical societies had already formed and were publishing the findings of local luminaries. Communication was slow, often relying on the post. Travel was also slow, expensive and potentially dangerous. If you had an interest in natural history, the local society was the best way of meeting, sharing ideas and learning new skills. The telephone and motor car changed the situation somewhat, but at first they were expensive and restricted to the wealthy.

The Natural History Society therefore became a major centre of biological recording. Some of the great societies such as the Yorkshire and Lincolnshire Naturalists' Unions organised themselves to maintain records of their County's plant and animal life. Such data were held on record cards and were difficult to maintain and to access. Records were published in their Proceedings and are valuable sources of early data, even though some records have to be treated with caution. County atlases ensued, primarily botanical and ornithological. These early atlases were constrained by printing technology: it was expensive and the inclusion of illustrations increased the costs dramatically. Colour was prohibitively expensive.

During this period, the literature available to natural historians also grew, but it too was constrained by cost. The novice was faced with numerous challenges just to get to grips with relatively straightforward taxa; only the rare individual ventured further. Most emphasis was on those taxa for which there were readily accessible guides - butterflies, beetles, flowering plants, moths. In those days there were, however, local and national museums with knowledgeable curators. I still fondly recall visiting Eric Philp at Maidstone Museum and Steve Thompson at Scunthorpe Museum. Natural history curators are now a very rare commodity and museums are 'visitor experiences' that deliver a very different educational message.

This background paints a picture of what might seem to be nirvana to some. To others, it would have been unfathomable. If you were curious and confident you would join the local society, often at a very young age. If I recall correctly, I first started to attend meetings of the entomology section of the Croydon Natural History and Scientific Society (CNHSS) when I was

about 16 or 17. There were several other youngsters there too - Graham Collins, Jim Porter and David Lees; all of whom are now well known in their respective circles. That young cohort is today's 'old guard'.

Today, those same societies are worrying about their future. I understand that the entomology section of the CNHSS still meets, but there are no young people attending. Some societies have already folded or are effectively inactive, and there is a general cry of "where are the young people" and "how can we increase participation amongst the young?"

What has triggered the change?

For me, the starting point lies in population mobility and the tendency for people to move in association with their jobs. Relatively few people are confident in new surroundings and it takes a while to settle in. What is more, you might only be there for a few months or years, so is there any point putting new roots down? Often the job will be all-consuming and you may work a long way away from the meeting place of the local society. Alternatively, you may live a long way from work and the daily commute takes its toll. Many jobs also involve weekend work, so field meetings have to be fitted into a much more complicated lifestyle. I'm sure this is a factor behind the decline in attendance of meetings of the London-based societies and, if that is the case, it probably applies elsewhere.

For younger people, they probably cannot attend unless parents transport them to societies and are possibly more likely to attend Watch groups than a natural history society. Add to this the modern concern about paedophilia, it is hardly surprising that parents might be reticent about their children attending meetings of (largely) older men!

It is equally significant that transport is now so much easier. Not only do the majority of people own cars, many can also afford expensive holidays to far-flung corners of the world. They can watch lemurs in Madagascar, the mega-fauna of the African plains or explore the rainforests of Costa Rica. At home, they might be on Shetland one day and on the Scillies the next. The lure of the local natural history society is no longer as strong. We also see the phenomenon of 'pan listing' - people who aim to record vast numbers of species across the taxa for the sake of accumulating a list rather than developing niche skills.

This follows into a third, and equally powerful, reason why we don't see the numbers of young people joining societies. Electronic media have provided the instant communication that is so dominant today. If you don't know what something is, you no longer need to retain a specimen and take it to the next meeting of your local society; nor do you need to attend the society's field meetings to acquire skills from the experienced specialist. All you have to do is pick up your iPhone, take a photograph and post it on iSpot or one of the specialist Facebook groups. Hey-presto, you will get an almost instantaneous response from someone who might (or might not) know what they are talking about. That satisfies your curiosity, and it is free! There is no need to feel awkward in a room full of strangers and your lack of knowledge does not hold you back from becoming an instant expert!

We must not forget the other technological revolution: modern desktop publishing and cheap colour printing. The range of guide books that is available today is completely mind-boggling. What is more, they are so cheap when compared to the cost of guides one or two generations

ago. We must not forget, however, that these guide books are the culmination of years of effort, often by members of local societies. Whilst at one time it was very difficult to get technical guides published, there are now publishing houses that are hungry for new products (provided they can sell enough to make a profit). If demand is too small, however, the specialist text will not get published and there remains a need for an alternative way of publishing, i.e. the local and national society.

These technological revolutions have given modern natural historians the idea that there is no connection between the local and national societies and the products and services that they depend upon. Equally, governments do not make a connection between the technical expertise available in the non-vocational sector (citizen science) and the technical specialist jobs that once existed in the public sector. If you dispense with jobs in museums, departments and agencies that required technical expertise, the ensuing loss of skill-base and training will ultimately feed into the non-vocational sector. YNU's own survey of Members shows that a very substantial proportion of them are/were employed in a natural history discipline. It does not follow that if people are not employed in specialists roles they will go on to become specialists in their own time. There are too many modern conflicting pressures and easier-hanging fruit to be picked by jumping in the car or onto an aeroplane.

Biological recording - a growth industry

Whilst we may have seen a decline in the numbers of natural history societies and membership of remaining societies, there has been no comparable decline in the numbers of people contributing records; indeed, the rate of growth in datasets is staggering. A lot of this can be attributed to modern data collection systems. We no longer need card-indexes: the spreadsheet and specialist database such as MapMate are now available to very nearly everybody. As a result, our casual records can be noted with ease. Equally, if we are so inclined, we can enter our daily observations on iRecord, BirdTrack and a host of other on-line tools. Even I now record the occasional bird, mammal and plant!

DEFRA, the statutory agencies and various NGOs have made huge investments in biological recording. The National Forum for Biological Recording (NFBR) is a relatively new body (though now over 30 years old), as is the National Biodiversity Network (NBN). In a World context, the Global Biodiversity Information Facility (GBIF) has made a significant step forward in organising world biological data. There are other platforms beyond the UK: I recently came across 'Observation International' that provides platforms for data assembly and dissemination. A lot of this is possible only because the technology exists. The museum curator who emerged from an Aladdin's Cave office has effectively been replaced by a computer jockey who, at the press of a few buttons, can bring up maps, reports etc, but probably cannot tell you what the photograph of x or y actually is. For that you need a specialist, most probably an ex-museum curator or statutory agency specialist who now provides a free on-line identification service. There is also, however, a broader cohort of such specialists who have gained their expertise entirely in their spare time. Many of them share it with a wider community in much the same way as they would have done at the meetings of the local natural history society.

An emerging tension

The organisations that are heavily dependent upon biological data often lack technical specialists; indeed there was a noticeable cull of such specialists at various points in the past

40 years. Mergers, downsizing and privatisation of organisations such as MAFF, the Institute of Terrestrial Ecology, the Nature Conservancy Council (and latterly English Nature and the Countryside Council for Wales) have all been accompanied by shedding the 'greybeards' and 'wise men' (and women!). There has also been a marked contraction in specialist jobs at the Commonwealth Institute and places such as the Natural History Museum and the National Museum of Wales. Many of those former specialists are still alive and are the backbone of some technical specialisms today. But, what happens when they die? Who will replace them?

For me, the biggest tension lies in the shift towards photography as a medium for biological recording. I am one of those scheme organisers who has engaged with this form of recording, but there are many others who will not; they pose a variety of arguments against this approach, all of which have veracity, to a greater or lesser extent:

- *'You cannot identify the majority of this taxonomic group from photographs'*. This of course is the case for those taxa that require slide mounting, genitalia dissections or examination of structures at very high magnification. But, I think that one also has to recognise that not all photographs are a grainy blur - modern photography is often quite stunning. I think there is an urgent need to quantify the claims, both positive and negative. There is also a whole new discipline of live animal taxonomy that needs to be investigated - they are subtly different when alive and some have a jizz that is lost when dead.
- *'I cannot see any point in acquiring vast numbers of records of common species'*. Why the fixation on rarity? True, it is always nice to see rare species but if they <u>are</u> rare then you would not expect to see them very often anyway. In the case of hoverflies, and perhaps many other taxa, rarity does not necessarily equate to difficulty of identification, although perhaps in part this difficulty is a factor behind perceived rarity. Also, I suspect that some species are rare because they have short emergence periods or behave in ways that are not apparent to the specialist; the non-specialist may just happen across them and fill in the gaps. A brief analysis of data for 2016 showed that 18 out of the 82 species of hoverfly listed as rare and threatened were recorded by photographic recorders. Bearing in mind that 30 species are impossible or highly unlikely to be recorded by photography, the proportion of potentially doable species recorded in 2016 was substantial (34.6%).
- *'It is a waste of time as you will gain no new ecological knowledge'*. I think this is fundamentally wrong. If one has a bigger dataset it is possible to get more from the data. In the case of hoverflies there has been a remarkable improvement in our knowledge of winter hoverflies and an equally valuable increase in data for some climate-sensitive species. True, there are limitations, but the results speak for themselves. Also, by extracting the data from photographs myself, a very large flower-visit database has developed. It is not perfect, but is improving.
- *'I am not prepared to let the computer rule my life'*. On this point they are completely correct. There is almost infinite demand for specialists to provide identifications and advice. Two people recently commented to me that they believe that engagement with social media has ruined my life; they may well be right, as I can no longer take a day away without suffering on subsequent days. Also, I'm afraid that whilst most people behave well, some can be very demanding and expect from you far more than is reasonable; a few are quite abusive when you cannot/will not give a definitive answer.

The list could be a lot longer, but this small selection of issues highlights the sorts of tensions that emerge. Added to which, one must ask the question "Do the data providers and users really understand how small the specialist cohort really is"? Calls for ever increasing levels of biological recording are substantially dependent upon a very small number of active specialists who are willing to engage and to provide training courses. One very capable Dipterist once commented to me "I like the field work but I do not want to get involved in administration". This is the nub of the problem: reliance on specialists to identify specimens from photos and to verify on-line records turns them from field naturalists, with an interest in recording, into recording administrators who might occasionally do some field work. For most, that is a step too far.

Is there a way forward?

The YNU survey of its own members tells an interesting story (see Lightfoot, Millard & Warrington, 2016). For me, some of the critical issues lie in the responses of members/former members who did not attend meetings. Examples include:

- "I lack experience so feel unable to contribute".
- Cliquishness.
- "YNU wasn't very welcoming to less experienced people 20 years ago".
- "I always felt [that field meetings] were aimed at people other than me".

I think that there is a need for societies to be relevant to up-and-coming generations, so I would start with trying to understand what would get non-members to engage and to describe what would get them involved? Part of the problem, I suspect, is that there is encroachment on the traditional role of natural history societies by organisations such as the Wildlife Trusts and RSPB, both of which run activities such as bioblitzes and the Big Garden Bird Watch'. Where do traditional societies fit into this model? I wonder if this encroachment has something to do with the apparent dearth of younger amateur natural historians represented in the YNU survey?

Both of the above parameters point to a need for a change in the societies, but there is a further issue: generating new membership by initiatives demands high levels of engagement by individuals. Moreover, it calls for members to be open to discussing issues with newcomers and making sure that they do not feel marginalised or too inexperienced to participate. Such public engagement can be very time-consuming and may not give rapid results; it takes time for reputations to change and for perceptions to be shifted from negative to positive. It therefore means that those of us who care about the future of our societies must put the effort in to raise awareness, show the relevance of societies, and foster the ethos of long-term engagement in ensuing generations.

For me, one of the obvious benefits of developing an 'on-line' community is the way that more active participants start to 'know' one another. When I posted the idea that I was thinking of organising meetings that the UK Hoverflies Facebook Group might like to attend, there was an immediate positive response from about 20 people. I then hit my first snag: if I ran such a trip, I would need insurance; that calls for investment by me, or reliance on a society. All of a sudden the traditional society becomes very relevant!

A further consideration is the need to generate young leaders. I am always amazed when I talk to people, how many lament the lack of activities that fit their needs/desires; and yet they never think of taking on the challenge and organising such activities themselves. In this respect, why not create affiliations between University Biology/Zoology/Botanical Societies and the YNU (if they are not already affiliated) - get their developing luminaries to run meetings that are primarily for the university group, but which would benefit from a few specialists attending. That might help to break down barriers and perceptions, whilst also growing leadership potential. To do this, somebody/several people need(s) to talk to relevant universities, of which there are plenty in Yorkshire.

The scouting movement is another avenue for engagement. Last year I did a preparatory study for Kent Wildlife Trust that investigated the willingness of different organisations to get involved in marine conservation. What really struck me was feedback from Scout leaders who commented that they were always on the lookout for new ideas and activities that their pack might get involved in. Scouting and biological recording potentially go hand in hand as many scouting skills depend upon an ability to read the countryside.

It is not a one way street, however. One of the critical points I would raise with undergraduates and recent graduates is the need to develop attributes that have an influence on employers. When running the 'paper board' for jobs in English Nature, I was always amazed at how few applicants mentioned that they were members of a local or national society, or that they took part in activities such as bird ringing, a bat or badger group. 'I like walks in the countryside' was often the most that one might find as evidence that they were really interested in the subject and might take the trouble to develop the skills that compliment those acquired directly from work. Needless to say, with me those who showed an interest were far more likely to get interviewed! It is a simple message but very few people say anything or recognise the issue. I think that those bodies who seek expansion of biological recording need to make some connection between their employment policies and the sorts of skills they seek from the wider populus.

Concluding comments

The narrative of this presentation points to a sequence of remarkable changes in the way biological recording has evolved. This evolution, together with our proud history of non-vocational natural history specialists, places the UK at the forefront of data collection on aspects of the natural world. Few nations can match it. In many parts of the world biological recording is still in its infancy and largely confined to academia. In some countries, taxonomy and related recording skills are an exciting new branch of science. That was once the case in the UK but we have left those days a long way behind.

It is unlikely that taxonomy will ever return to favour within UK academia. Nevertheless, a lot more could be done to make the acquisition and employment of applied taxonomy skills relevant to the working world. At the same time, it is incumbent upon everybody who has a love of wild places and their inhabitants to help to conserve them. In an age when the politicians demand "evidence-based policy-making" there is a real need to ensure that the evidence is reliable and robust enough to withstand the inevitable challenges from those for whom the messages are unpalatable. This is where the local and national societies still have a central role to play. They need to raise their heads above the general mêlée and establish themselves

as the centres of excellence that people want to join because they are making a difference. That journey starts with launching new initiatives - county atlases are a great start. Then there comes return visits to atlases but within these doing the analysis to show what has changed and why such changes might have taken place.

In my view, even the novice can start to make a difference almost immediately if they use a camera and develop diligent recording skills. I see the day that somebody posts their first photograph on iSpot or the UK Hoverflies Facebook page as the first step on a journey that might elevate them to becoming the next David Attenborough or Chris Packham. We need to nurture and encourage the young and the old alike.

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A survey of ferns on drystone walls in the Yorkshire Dales

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Introduction

At first sight drystone walls appear to be a random collection of stones balanced precariously on top of each other. A closer look at these structures will show that they are far from disorganised. Most drystone walls in the Dales are in effect two walls with a gap in the centre filled with smaller stones. The two walls are held together with larger through-stones which project out from the wall on both sides. Finally, the top of the wall is finished by a line of large stones which again lend stability to the structure. One might expect that these walls would offer an unattractive habitat to vascular plants. When newly built they are solid structures with little space between the stones. The walls are devoid of any soil, their exposure to the elements causes them to suffer extremes of temperature, and they can be virtual deserts as rain quickly drains from them (Darlington, 1981).

However, though walls form an unpromising habitat, some vascular plants have managed to exploit these man-made environments. Early botanists noted a number of plants which could be found living on walls. For example, John Parkinson wrote in his *Theatrum Botanicum* of 1640 “English Maidenhaire growth upon old stone walls in the west parts and Wales”. He also recorded Wall-rue growing ‘both upon stone walls and the sides of Rockes or gravelly Springs, and other shadowy and moist places’, and reported it growing on the church walls at Mayfield in Sussex.

Since then several local surveys of walls have been undertaken (described below): some in cities such as Cambridge, Exeter and Durham and others in rural Wiltshire, Somerset, Ireland

and Scotland. These rural walls were drystone. The number of vascular plant species recorded varied from 75 in the Mendips to 226 in Durham. However, as far as I am aware no survey of the flora of walls in the Yorkshire Dales National Park (YDNP) has been undertaken. The purpose of this study was to survey the ferns growing on drystone walls and consider some of the factors which may influence their distribution and explore how this contributes to our understanding of the ecology of walls.

Survey

In total 78 c.100m sections of walls were selected for the survey so as to provide a range of geology, altitude (between 150 and 660 m) and locations throughout the un-extended YDNP. Each wall was surveyed three times between April 2015 and September 2016 to ensure full seasonal coverage. All, apart from one, featured in an earlier survey of snails (Pearson, 2016).

Results

Overall there were 13 species of ferns identified during the survey (Table 1). The most common were Common Polypody (found on 22% of walls), Maidenhair Spleenwort (22%), Male-fern (15%) and Wall-rue (13%). The remaining nine ferns were found on only one to three walls (1—4% of walls). The majority of the walls in the sample (60%) contained no fern species. Yet on one wall in Crummack Dale seven ferns were identified. A wall can differ from another wall in various ways including what stone it is built from, elevation, aspect and so on. Do any of these factors correlate with whether a wall supports few or many ferns?

Table 1. Ferns discovered with wall type preferences.

Fern	Scientific name	Limestone (n=29	Non-limestone (n=20	Mixed (n=29)
Common Polypody*	*Polypodium vulgare*	8	2	7
Maidenhair Spleenwort	*Asplenium trichomanes*	10	1	6
Wall-rue*	*Asplenium ruta-muraria*	6	0	4
Male-fern	*Dryopteris filix-mas*	2	3	3
Bracken	*Pteridium aquilinum*	0	1	2
Hart's-tongue Fern	*Phyllitis scolopendrium*	0	0	2
Lady-fern	*Athyrium filix-femina*	0	0	2
Rusty-back Fern	*Ceterach officinarum*	0	0	1
Hard-fern	*Blechnum spicant*	0	0	1
Green Spleenwort	*Asplenium viride*	0	0	1
Brittle Bladder-fern	*Cystopteris fragilis*	1	0	0
Broad Buckler-fern	*Dryopteris dilatata*	0	1	0
Common Horsetail	*Equisetum arvense*	1	0	0

* see Plate 3, centre pages.

Calculation of the Pearson correlation coefficient for the total number of ferns and the altitude of the walls showed that there was no statistically significant relationship ($r = -0.12$, $p = 0.26$). Using an unrelated t-test the total number of species was compared for different aspects of the walls. So for example north/south facing walls were compared with east/west facing walls. Again no statistically significant relationship was found ($t = 1.05$, $p = 0.30$, $df = 26$). Finally,

comparisons were made for the total number of ferns found on the three different geologies: limestone, acidic rock and mixed. The mean for the non-limestone walls was the lowest (0.5), with that for the limestone walls being 1.0, and the mixed geology walls the highest at 1.1. No statistically significant results were found (the t-values ranged from 0.27 to 1.39, with p ranging from 0.17 to 0.79, and degrees of freedom ranging from 47 to 56). So we are none the wiser why some walls are richer in ferns than others.

Having started with a quantitative analysis perhaps it may be more useful to look at the habitat requirements of individual ferns to provide a better understanding of their distribution on walls.

The two most common ferns were Common Polypody and Maidenhair Spleenwort. While both are known to grow on walls and rocks the former is also found on trees and said to be a weak calcifuge whilst the latter favours a lime-rich environment (Page, 1982). Common Polypody was recorded on eight limestone walls. Maidenhair Spleenwort was generally found on limestone or mixed walls and yet was recorded on the single non-limestone wall. Male-fern is possibly the most common fern in England and its preferred habitat is damp woods, hedges and other shady areas. The survey showed that this fern was more often found on non-limestone and mixed geology walls although it was recorded in two instances on limestone walls. Again this may suggest that pH is less critical for Male-fern and that moisture is a more important factor. On all walls it tended to be found nearer the base of the wall rather than at the top. In other words in sheltered, damper spots. Wall-rue is said to prefer basic rocks and in this sample was not found on acidic rock. All the other ferns were found on three or less walls. All matched their known preference as calcifuges or calicoles.

Discussion

There have been a number of studies of the distribution of ferns in England, Scotland and Ireland by Hill (2008), Payne (1989), Presland (2008) and Willmot (1978 & 1979). Unfortunately, not all of them distinguish between the geology of the stone used to build the wall, whether mortar had been incorporated in the structure or local methods of construction. For example, in the west of Ireland and elsewhere turf sods may be placed on top of walls or just below the top stones (Willmot, 1983). The surveys in cities by Bolton (1985), Rishbeth (1948), Shimwell (2009) and Woodell & Rossiter (1959) also included brick walls so they have been excluded from further consideration. Before examining the other studies it is worth considering whether there are any differences in the fern floras of the natural habitats of bare rock and scree compared to that of walls.

The only study I am aware of was a survey conducted in the Killarney district of County Kerry (Willmot, 1983). Although the sample consisted of both earthed, drystone and mortared walls of mostly acid stone, there were some clear results. Similar ferns lived on bare rock and walls, but the species richness was much reduced on scree. The ferns which were most common on bare rock and scree were the Lady-fern, Scaly Male-fern *Dryopteris affinis*, Hard-fern, Broad Buckler-fern and Hay-scented Bucker-fern *Dryopteris aemula*. Conversely, the ferns more common on walls were Hart's-tongue, Maidenhair Spleenwort, Wall-rue, Rusty-back and Common Polypody. Therefore, it appeared that the ferns did not colonise walls in the same proportions as those living on scree or bare rock.

As part of a larger study of limestone pavement, Willis (2011) collected data on ferns living

in this habitat in the Yorkshire Dales. In total, 14 species were identified from 24 areas of pavement. All the ferns occurred in higher frequencies than on the walls in the current study. For example, Maidenhair Spleenwort was found in all the limestone pavements, Wall-rue and Brittle Bladder-fern occurred in over 90% of the sample, Green Spleenwort, Male-fern and Hart's-tongue appeared in over 80%. Even the Common Polypody was found in 38% of pavements. Although similar ferns were found in both habitats the limestone pavement was richer in species. This may suggest that the geology is not of prime importance but rather other environmental conditions, such as availability of moisture and shade, may be more influential on fern species richness. It has also been suggested that pavement floras are relict populations of a woodland habitat (Silvertown, 1982).

In a study of the ferns growing on walls in Berwickshire (Willmot, 1978) a comparison was made between the number of ferns growing on walls constructed of the local acidic siliceous rock and those with added mortar. More species were found on mortared walls (12) compared to other drystone walls (8). Although this may suggest that the lime-rich mortar provided an attractive substrate for the calcicolous ferns this was not tested statistically.

Table 2 is a summary of surveys of drystone walls of known geology, excluding those with mortar, for the Burren (Willmot, 1979), Wiltshire (Presland, 2008), the Mendips (Hill, 2008), Berwickshire (Willmot, 1978), Chew Valley (Payne, 1989) and the Yorkshire Dales (this study). The ferns are ranked in frequency. For example, in the Burren Maidenhair Spleenwort was the most frequently encountered and Soft Shield-fern *Polystichum setiferum* the least. For the limestone walls, the Yorkshire and Wiltshire samples had similar numbers of species but only two in common. There were more ferns found in Ireland and all the Yorkshire ferns were found in the Burren. For the acid rock walls similar numbers were found in the Burren and the Dales, but the richest walls were in Berwickshire. All the Yorkshire ferns were found in the Scottish group apart from Bracken. Only about half the ferns were in common between the Irish and Dales samples. The Mendip survey was included in the mixed geology group because the sample, although predominantly of limestone, included some sandstone, breccias and a few mortared walls. Of the group of surveys in Table 2 the Dales sample showed the greatest fern species richness with the Chew Valley the least. All the Chew Valley ferns were found in the Dales but this was not the case with the other Somerset sample.

Table 2.

	Limestone			
	The Burren (n=25)	Yorkshire Dales (n=29)	Wiltshire (n=25)	The Burren (n=8)
No. of species	8	6	4	6
Rank frequency	Maidenhair Spleenwort Common polypody Rusty-back Wall-rue Male-fern {Black Spleenwort, Brittle Bladder-fern, Soft Shield-fern	Maidenhair Spleenwort Common polypody Wall-rue Male-fern Brittle Bladder-fern Common Horsetail	Intermediate polypody Wall-rue Rusty-back, Hart's-tongue	Common polypody Wall-rue Hart's-tongue Maidenhair Spleenwort, Lady-fern, Broad Buckler-fern

Table 2 cont.

	Acidic			Mixed	
	Yorkshire Dales (n=20)	Berwickshire (n=20)	Mendips (n=74)	Yorkshire Dales (n=29)	Chew Valley (n=40)
No. of species	5	8	7	10	3
Rank frequency	Male-fern Common Polypody Maidenhair Spleenwort Broad buckler-fern Bracken	Common Polypody Male-fern Broad Buckler-fern Maidenhair Spleenwort Lady-fern Soft Shield-fern Hart's-tongue Hard Shield-fern	Maidenhair Spleenwort Intermediate Polypody Rusty-back Scaly Male-fern Soft Shield-fern Male-fern	Common Polypody Maidenhair Spleenwort Male-fern Wall-rue Lady-fern Bracken} Hart's-tongue Rusty-back Green Spleenwort Hard-fern	Intermediate Polypody Maidenhair Spleenwort Rusty-back

So is it possible to make sense of this confusing picture? What is clear is the variability in the fern floras of drystone walls! In terms of species richness the walls of Wiltshire and Chew Valley were the poorest with about double the number of ferns in the Mendips and Berwickshire. The most species were found in the Burren and the Yorkshire Dales. The geological diversity of both areas may be a significant contributor to this. When considering the occurrence of the ferns there are also some striking differences. For example, Common Polypody was recorded on 70% of walls in Berwickshire and 60% for the Burren. Although this was one of the commonest ferns in the Dales sample it was found on only 22% of the walls. Intermediate Polypody *Polypodium interjectum* was recorded in less than 20% of Mendip walls and yet it appeared on 58% of nearby Chew Valley walls. The evidence suggests that other environmental, non-geological factors, are responsible for this variation.

One factor that has not been considered is that of altitude. The normal range of altitude for the distribution of ferns shows some interesting features (Page, 1982). For example, the normal range for Hart's-tongue is from sea level to 200m whilst for Common Polypody the range is from 160 to 670m. With this overlap in ranges one would not expect that the number of ferns would decline with altitude. In the Dales sample the altitude of the walls ranged from 150 to 660m. All 13 ferns identified would be expected to grow within this range though not over the complete range. Thus it is not surprising that there was no correlation between the number of species and altitude.

Drystone walls have a very low water-holding capacity. It has been estimated that in the case of limestone over 60% of rainfall runs straight off (Willis, 2011). There is also limited organic matter so the water-retaining capacity of many walls is low. It has also been documented that some ferns are better than others at surviving in intermittently water-stressed environments (Proctor, 2009). Desiccation-tolerant ferns include the Rusty-back, Wall-rue and Maidenhair Spleenwort. Their ability to revive after rain is very apparent in dry summers. Others, such as the Male-fern with summer-green leaves, are much more sensitive to drying out.

Finally, there is the question of what substrate the ferns are growing in. Some, like Wall-rue, are found wedged into crevices between stones. Presumably there is some organic matter trapped in the crevice to provide the necessary nutrients. Other ferns manage to find pockets of soil derived from residue from the weathered rock and the decomposed remains of lichens and mosses. No attempt was made in the survey to examine this substrate. Weathering of limestone provides very little insoluble residue (Willis, 2011), so perhaps in walls of mixed geology, it is the acidic stone which contributes most to the growing medium for the ferns.

Conclusion

The variation in the ferns recorded in walls in the survey cannot be explained by any single factor. Although the majority of walls did not contain any ferns the others showed species richness. However, as many of the ferns were found on a single, or at most three walls, it is perhaps not surprising that a statistically significant difference could not be demonstrated for a relationship between the geology and the total number of species. Other surveys have demonstrated that the Yorkshire Dales walls have a high fern species richness but also a lower occurrence compared with many areas. The reasons for this remain unclear.

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Yorkshire naturalists at war: Part 1 - News from the front, YNU members on active service

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Introduction

The Great War of 4 August 1914 to 11 November 1918 profoundly changed the social fabric of the United Kingdom, indelibly affecting most families, communities and institutions. Through the auspices of the Imperial War Museum numerous regional studies have been instigated across Yorkshire and throughout Britain to commemorate the centenary of the First World War, notably on the anniversary of the Battle of The Somme (July to November 1916). As a contribution to this initiative, it seemed appropriate to investigate how the Yorkshire Naturalists' Union was affected by or contributed to the war effort.

From the distance of a century, an examination of the Union's published output initially gave the impression that the conflict passed over the YNU with little effect. *The Naturalist* was still issued on a monthly basis, its editors [Thomas Sheppard, Curator of Hull Museum, and Dr Thomas William Woodhead, Lecturer in Biology at Huddersfield Technical College] annually filling between 407 and 420 pages with fascinating copy. The content continued to consist of reports of YNU sectional or Vice County field meetings, annual reports of the activities of the specialist sections, notes, observations and research by active naturalists and reviews of topical natural science items from the press or other scientific journals. However, a more considered examination revealed that beneath a standardised and dignified veil of polite presentation was evidence of the wartime food and materials shortages, a creaking transport system and, in articles marshalled under the heading 'News from the front', human tragedy and a waste of promising young lives. For those exposed to the paralysing stress and horrors of war, their abiding fascination for natural history and the natural world clearly provided redemptive moments and an ability to cope.

YNU membership

Since the Union had a primarily male membership (women only constituted 2.8% of individual memberships just prior to the war), the considerable loss of men during the Great War had the potential to significantly reduce both existing membership and future levels of recruitment. Mortality amongst members, as indicated by published In Memoriam and Obituary notices, did indeed rise during the period of the war though relatively few deaths were directly attributable to the war (see Figure 1). Also membership did decline but only marginally, dropping from 393 personal members in 1905 to 339 in 1921. The net loss of 54 members over a period of 16 years (a mean loss of 3.4 per year), seems an unexceptional effect of The Great War, particularly as the 16 years between published membership lists also included the peak post-war mortality year of 1919 which coincided with the pandemic of the devastating flu virus mutation of the so-called Spanish flu (Barry, 2004).

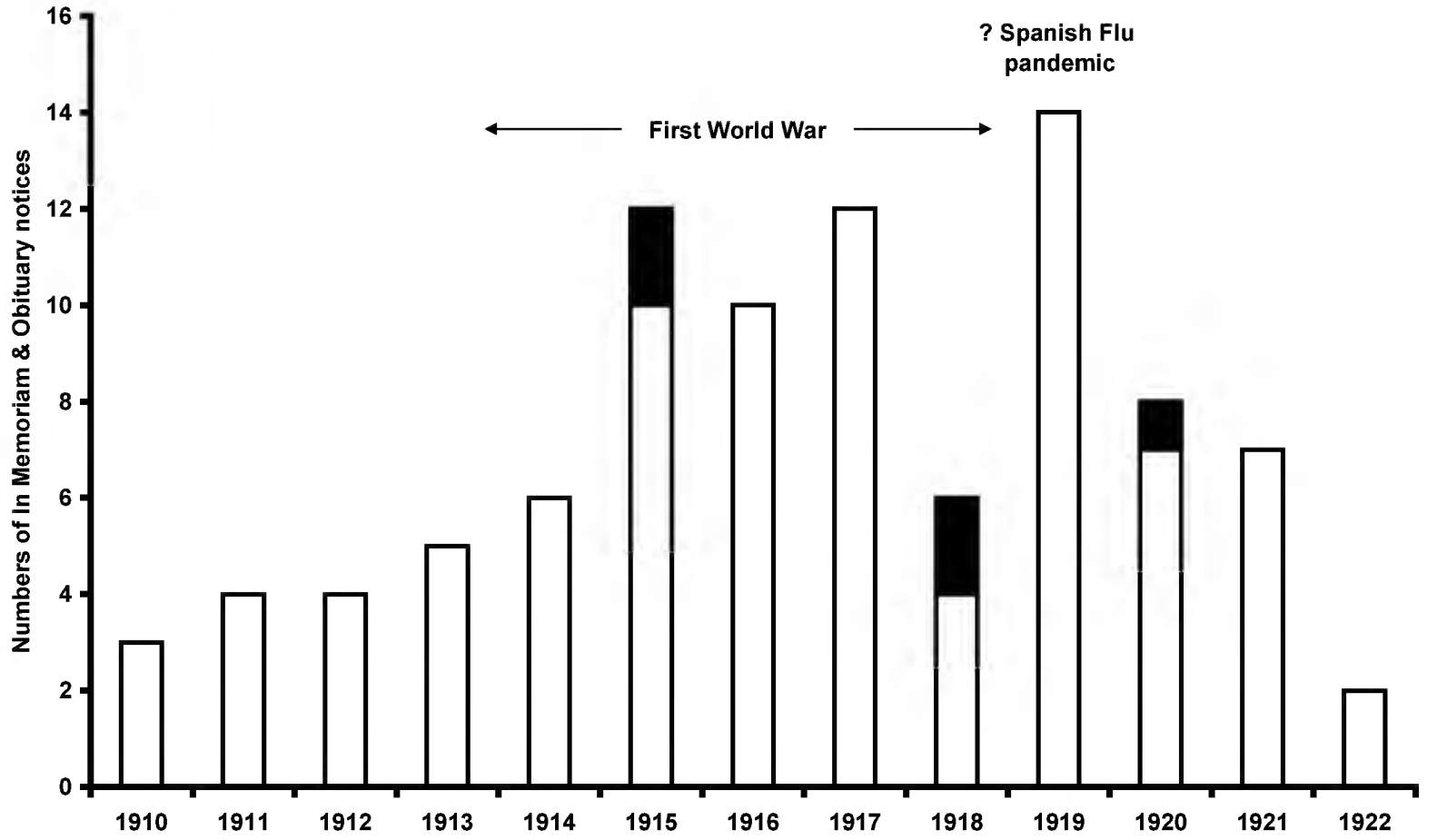

Figure 1. Annual numbers of In Memoriam and Obituary notices published in *The Naturalist* 1910 to 1922. Black cells represent individuals who served in WW1.

With the Union generally appealing to a middle-aged and older membership, few young men and boys of active service age were represented in the Union at that time. Figure 2 quantifies mortality of YNU members during the war years of 1914 to 1918 according to age group. Significantly, of those members who died on active service three were in their 20s (Graham Johns 20, H. Vincent Corbett 25 & George Mitchell 26) and one, J.R. Stubley was 30. The greater levels of mortality were members in their 60s and above.

By the 1930s the depleted wartime cohort would have been reaching the stage in life of being mature professionals and artisans likely to take part in the activities of the YNU and its specialist sections. Indeed, YNU membership dropped to its all time nadir of 260 by 1936, a phenomenon which probably represented the real, if delayed, impact of the Great War. A similar but proportional drop was registered in the 1958 membership list, which possibly represented the delayed aftermath of the 1939-45 Second World War (see figure 3).

Through the results of complex post-war societal, demographic and educational changes, a beneficial phenomenon to affect the Union was the real and proportional increase of female membership, reaching 8.8% of individual membership in 1921 and 21.6% after the Second World War.

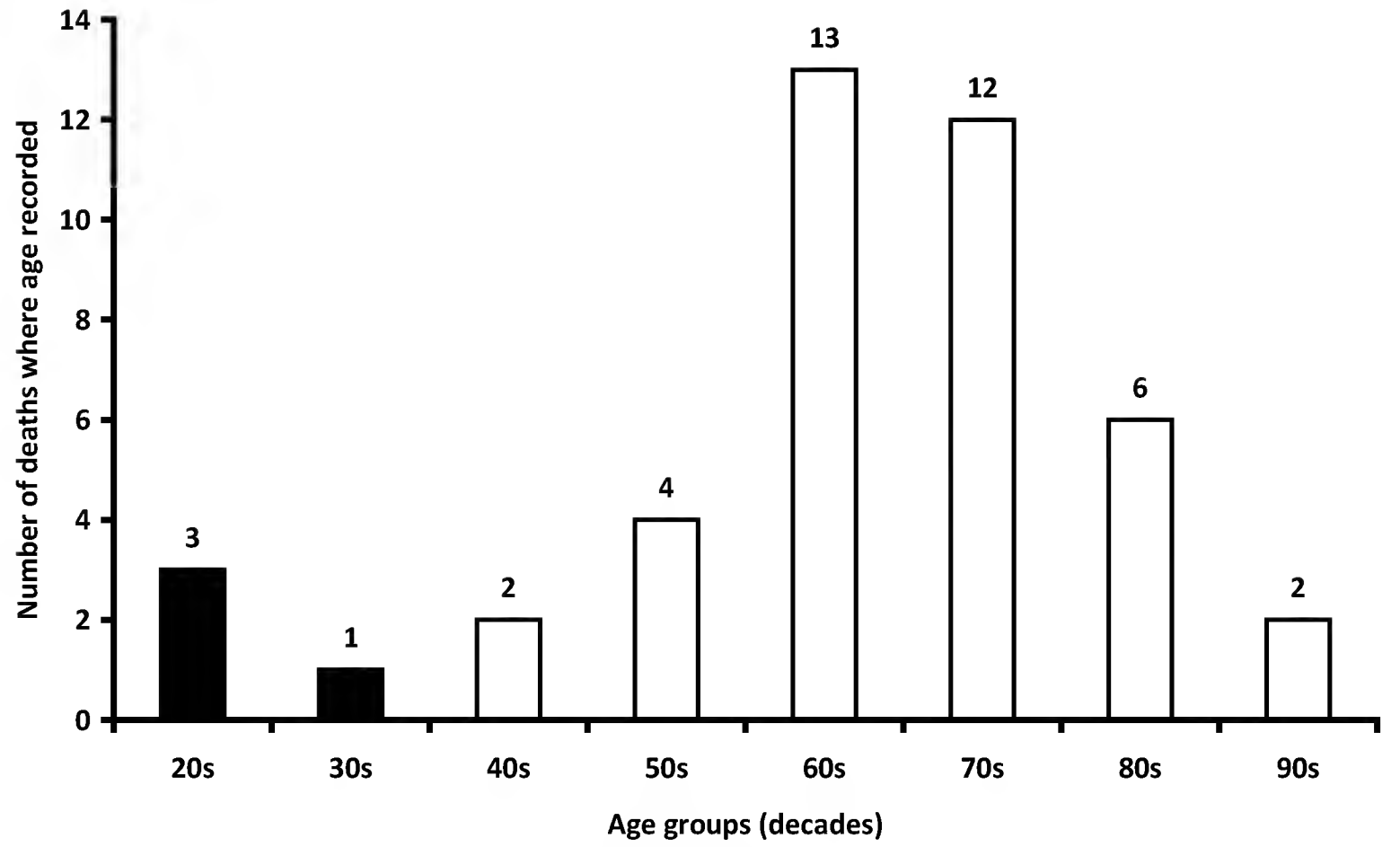

Figure 2. Age groups of deceased members 1914 to 1918. Black cells indicate members who died on active service.

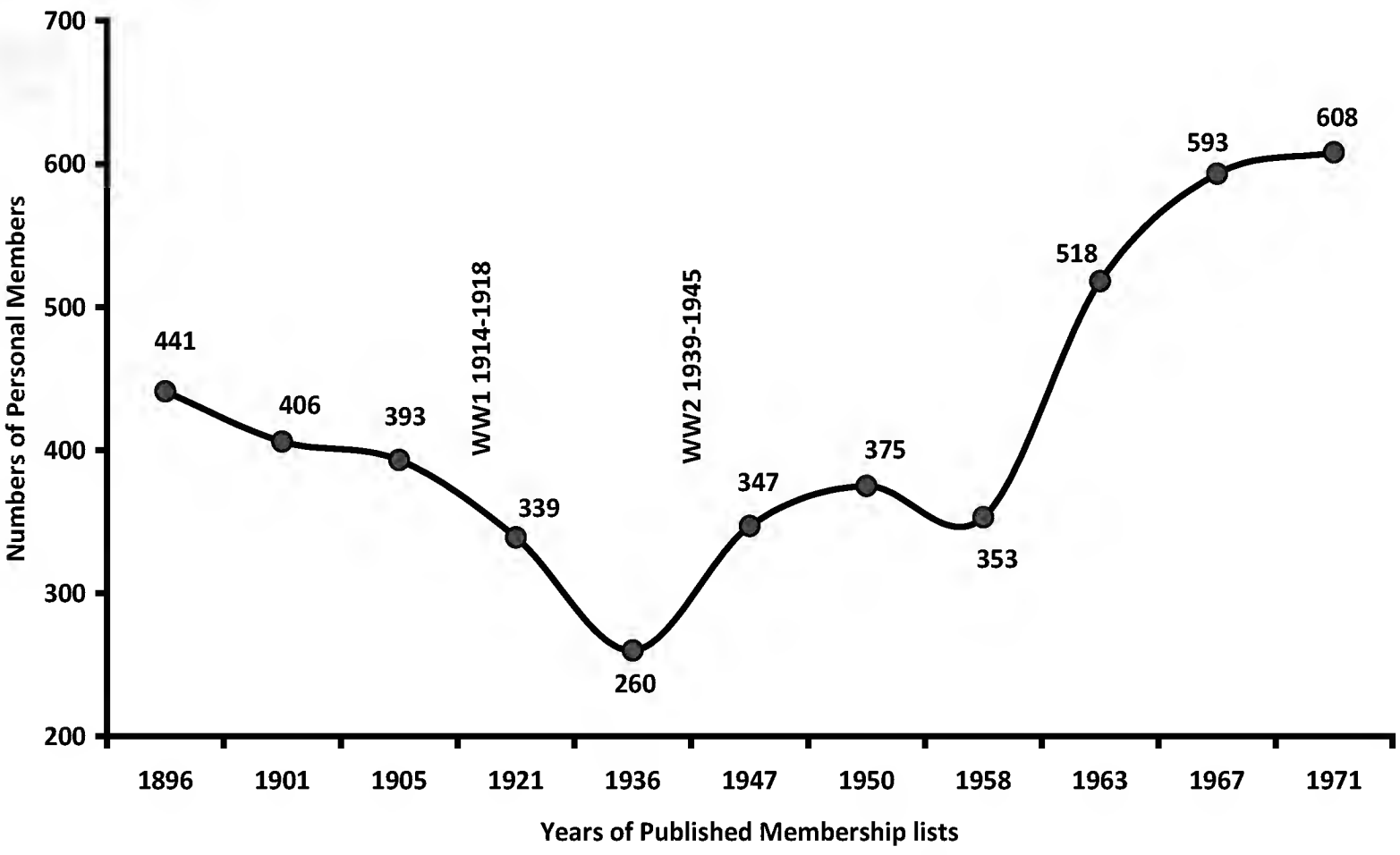

Figure 3. Fluctuations in YNU personal membership numbers 1896 to 1971 based on published membership lists.

YNU members on active service

The following YNU members who volunteered for active service in the forces or in non-combatant roles were either listed in YNU annual reports (Wattam 1916 & 1917) or featured in a range of Personal Notices in *The Naturalist* (see references). As a gesture of support the Executive of the Union agreed to waive their subscriptions for the duration of the war. Supplementary information has been provided by the specialist website https://www.forces-war-records.co.uk.

Dr E. Amyott
Charles Barr
S.H. Cauldwel
H.D. Cheavin FRMS, FNPS, FSE, Chemistry Dept, The Middlesex Hospital Medical School, Berners Street, London W1
Herbert Vincent Corbett 3 Thorne Road, Doncaster. Killed in action 17 October 1918 aged 25.
Dr A.R. Dwerryhouse DSc, FGS Oakfield Terrace, Headingley, Leeds.
Sir H.C.W. Hawley Bart served as a Captain in the Labour Corps. The Corps was manned by officers and other ranks who had been medically rated below the "A1" condition needed for front line combat service. Labour Corps units were often deployed for work within range of the enemy guns, sometimes for lengthy periods. Many were returned wounded. Captain Hawley was wounded and died after the war in 1924 at the age of 47.
Dr Wheelton Hind BSc., MRCS, MD, FGS the celebrated geologist rose to become Lieut. Colonel in the Territorial Army in Stoke-on-Trent. He served with a battery of the Royal Garrison Artillery which he raised in 3 weeks and, although approaching 60, he took his battery to France and saw "severe service". He was injured and invalided home where he transferred to the Royal Army Medical Corps and was placed in command of a busy war hospital. He died shortly after the war 21 June 1920 at the age of 61. His geological collection consisting of about 7000 British carboniferous fossils was assembled in the course of c.30 years researches in British carboniferous stratigraphy and included c.1,270 figured specimens and c.500 type specimens. It was bought for the nation in 1923 by the Natural History Museum (Wroot, 1920).
Lieut. Graham Johns of 24 Rutland Park, Sheffield was the son of the Sheffield botanist Cosmo Johns and attended YNU excursions with his father. He was educated at Cheltenham College and Gonville and Caius College, Cambridge University. He was gazetted to the Scots Guards in December 1916 and killed in action 27 September 1918 at the age of 20 (Anon, 1918b).
C.W. Mason 78 Beverley Road, Hull.
W.A. Millward BSc
2nd Lieut. George Mitchell The Park, Ecceshill, Bradford. Joined the Black Watch, killed in action 2 July 1915 aged 26 (Booth, 1915).
E.W. Morse Staff Postal Branch, P.O., Leeds.
A.R. Sanderson
George Sheppard BSc, FGS
Dr Herbert Douglas Smart served as Captain in the Royal Army Medical Corps. Active on the Somme in 1915 to 1916. He received injuries 10 September 1916 and was invalided home.
S.H. Smith 78 Huntington Rd, York.
T. Stainforth BA, BSc 90 Ryde Street, Hull.
Major A.J. Stather 206 Westbourne Avenue, Hull. East Yorkshire Regiment.
J.R.Stubley Served as ambulance driver in the Voges, died aged 30 on 27 December 1915.
E.W. Taylor Staircliffe, Mount Villas, York.

Prof. J.H. Priestley BSc Botany Dept, Leeds University.
F.W. Whittaker 10 Upper Howard Street, Batley.

NEWS FROM THE FRONT

Ornithological notes from 2nd Lieutenant George Mitchell of Bradford. Readers of *The Naturalist* will be glad to see the following note received from Mr George Mitchell, a member of the Vertebrate section of the Yorkshire Naturalists' Union, who is now with the British Expeditionary Forces in France. He states "I have several times seen Kestrel hovering between our trenches and the Germans, absolutely taking no notice of the rifle fire, and also saw a Common Buzzard starting to soar within 20 yards of the ground and not 200 yards behind our fire trenches!! All the birds have got quite used to the war and one can see larks and their broods which they have reared within 20 yards of our trenches' (Mitchell 1915). This field note was the last item in the August edition. Tragically the September edition carried the notice of George's death (Booth, 1915 & Wattam, 1916).

Collecting Butterflies & Moths on the Somme: notes from Captain Herbert Douglas Smart RAMC. On 6 November 1916, at the invitation of Dr H.H. Corbett, the Annual Meeting of the YNU Entomological Section was held at Doncaster Museum [then at Beechfield House, Waterdale, on the site of the new Civic Offices]. At the evening session, presided over by Professor Walter Garstang of Leeds University, Mr Ben Morley [Huddersfield] gave an address based on a collection of thirty-one species of Butterflies and about sixty species of Moths collected under remarkable circumstances by his friend Herbert Douglas Smart while serving in the region between Arras and the Somme Valley in France earlier in 1916 (Morley, 1917). On active service Dr Smart was a Captain (later Major) in the Royal Army Medical Corps with the British Expeditionary Force in Belgium and Northern France.

Considering the unprecedented levels of human carnage and colossal environmental destruction on the Somme during 1916, it was astonishing that anyone was left, had time or the presence of mind to catch, identify and study lepidoptera. Dr Smart's pursuit of his passion for entomology was no doubt a necessary means of coping with the grisly horrors of war.

Via the Army postal service he proceeded to send a motley succession of boxes and packages containing his lepidopteran captures to his friends Mr J. Hartley Durrant in London and Mr B. Morley in Huddersfield, who assisted with difficult identifications. Reports of his entomological records and observations were sent to Richard South, Editor of *The Entomologist* who serialised them in six episodes under the title *Notes on the Lepidoptera of the British Line in France* (Smart 1917a). In that his written reports contained dates, localities, descriptions of living conditions, were laced with scientific names and were being sent for publication, it was astonishing they passed the military censors.

The period covering his entomological exploits was the year ending on September 10th 1916, and the region visited was the British line from the Belgian frontier to the Somme. Captain Smart noting "In this period the infantry battalion to which I am attached has fought in and out of trenches at several parts of the line and has marched and billeted along most of it."

Collecting equipment and opportunities: "From the nature of my occupation, serious collecting has been impossible, and the insects taken or observed are mainly the result of day-time rambles. Collecting by night and by the rearing of larvae have both been impossible … Often I have had no net, and the difficulty of using a net in trenches needs experience for its proper appreciation." Of necessity, most collecting was by hand or by opportunistically examining or removing moths caught in spiders' webs. Species identification was reliant on his out-of-date book on European Butterflies (Kane, 1885) "but it's a useful size when one's kit is limited to 34lbs"

"My collecting has of course depended upon … the exigencies of my work, the latter varying from an easy two hours a day to an 'all out' ninety-six hours in four days."

Trenches: The Ruby Tiger *Spilosoma fuliginosa* "was common on the Somme and added to the beauty of the edging of spring flowers at that time decorating the trenches." This fascinating ecological observation shows how the seeds of annual arable weeds germinated and flowered well on the soils disturbed by the excavation of the trenches.

The Garden Tiger Moth *Arctia caja* "is common everywhere. Throughout the winter the larvae were very plentiful in the trenches at Armentières where millions of them suffered death from drowning, a fate that we ourselves had some difficulty in avoiding."

Under canvas: The Rustic Shoulder-knot Moth *Apamea basilinea* "was in swarms in the Somme area, with several in every tent and on every tree in a camp near Bray."

Finally, on 10 September 1916 Captain Smart nonchalantly records "… a shrapnel bullet put a stop to my continental activities."

Fortunately his wounds were not fatal. The next we know of him was 13 October 1917 from the London General Hospital, SE 5., writing on the subject of the occurrence and breeding of the Carnation Tortrix Moth *Tortrix pronubana* in London, then a new immigrant to the UK (Smart 1917b & c), later his address was Escrick Park Military Hospital, York. After the war he returned to General Practice at Clifton House, Shelley, Huddersfield (H.B.W., 1945 & Anon, 1946).

In the New Years Honours list of 1917 Herbert Douglas Smart received the Military Cross (M.C.), awarded for exemplary gallantry during active operations against the enemy, the London Gazette No. 29886 recording *The King has been graciously pleased to give orders for the award of the Military Cross in recognition of his services*.

Herbert Vincent Corbett of Doncaster (20.1.1893 – 17.10.1918). Vincent was the son of Dr H.H. Corbett, founder of the Doncaster Scientific Society and the first Curator of Doncaster Museum 1910-1921. He attended Doncaster Grammar School and held the honorary posts of curator of the school museum, librarian, magazine editor, House Captain and Captain of the School. Like his father, Vincent was an enthusiastic naturalist frequently attending meetings of the Doncaster Scientific Society and Yorkshire Naturalists' Union. Just prior to the outbreak of war, on 11-13 April 1914, he was out on field work with the YNU surveying the banks of the river Nidd upstream of Knaresborough, his list of beetles being published in *The Naturalist* (Corbett, 1914)

He attended Cambridge University where he studied for a History Tripos at St. Catherine's College. Being a member of the University Officer Training Corps, he volunteered for active service at the outbreak of War and on 8 October 1914 was gazetted 2nd Lieutenant in the 1st Cambridgeshire Regiment. The Cambridgeshires were then attached to the 11th (Service) Battalion of the Essex Regiment which, after training at Aldershot, served with the British Expeditionary Force in Belgium and France.

Samples of letters home during April 1915 were paraphrased in the *Doncaster Gazette*, including descriptions of days of heavy shelling, contrasting with natural history allusions from lulls between periods of frenzied action. "How calm and peaceful it is here – a quarter of a mile from the Germans. I cannot see a sign of war in this lovely fir wood … It is a delightfully sunny spring day; the Chaffinches [*Fringilla coelebs*] are hopping round us picking up the crumbs of our tea. They are very tame. A Brimstone Butterfly [*Gonepteryx rhamni*] is flitting about, gnats are forming tall columns among the trees; Tree Creepers [*Certhia brachydactyla*] are pecking the insects out of the bark." He mentions the discovery of two species of beetle, though the editor opts not to name them. In a subsequent letter he reports "Yesterday … the Germans were dropping shells a few hundred yards in the rear of our trenches and we could not spot their guns … so I went out in front of the trench, literally amid shot and shell, spotted the gun and took a compass bearing of it. The French 75s then saw to it that it didn't fire again. My Captain watched through field glasses to see whether or not I got blown to pieces or sniped! " (Corbett, 1915).

Within days, on 19 April 1915 near Ypres, Belgium he was severely wounded in the left shoulder and invalided home. During his convalescence his attention turned again to entomology, the YNU Annual report for 1915 noting "In the neglected order of Hemiptera Lieut. H. Vincent Corbett is to be congratulated on the results of his studies, although severely handicapped by circumstances. Of the sixty-six species … collected in the Doncaster district during the year, twenty three are new to Yorkshire. He has also paid considerable attention to the Homoptera … Several Ichneumons have been added to the county list … observations have been made or specimens captured by … Vincent Corbett at Doncaster" (Butterfield 1916). The Minutes of the Doncaster Naturalists' Society (1916) record that "In Entomology, the best work [in 1915] was done by Lieutenant H.V. Corbett during the time he was unfit for military duty. He collected Hemiptera of our district chiefly in Wheatley Wood and at Rossington. The result was an addition of almost 30 species of interest to the Yorkshire list …"

Vincent returned to Cambridge in June 1916 to take his BA Honours but, owing to ill health, was subsequently employed on home service. On 2 September 1916, whilst observing an ant nest in a Doncaster garden [presumably at his home at 3 Thorne Road] Vincent encountered a single, later a group, of worker Red Ants *Myrmica ruginodis* as they cooperated in overpowering and manoeuvring a relatively huge adult male Earwig *Forficula auricularia* into their underground nest, an operation which lasted from 5:20pm to 8:20pm. Careful notes were made of the sequences of manoeuvres and of the attack and defence strategies employed by both participants (Corbett, 1916). No doubt this fatal interaction was viewed as a metaphor for the unequal skirmishes he encountered on the Western Front.

On his recovery he returned to the 11th Essex Regiment in France in June, 1918, was promoted Captain but was killed in action during advances on Wassigny during the 'Battle of the Selle'

on 17 October, just 25 days before the end of hostilities. He is buried in Bohain Cemetery near Le Cateau (Anon, 1918a & https://www.forces-war-records.co.uk/). Fortunately his published records survive and some of the insects he collected are preserved in Doncaster Museum.

John Reginald Stubley (1885 – 1915) a woollen cloth manufacturer of Uplands, Batley, volunteered as an ambulance driver, taking his own vehicle over to France for the First Convoy of the British Ambulance Committee and was attached to the French Red Cross Society, Section Sanitaire Anglaise No 1. "He was a keen entomologist, and when there was a lull in the fighting in the Voges, where he was stationed and consequently few wounded to be brought in, he would continue the pursuit of natural history and rear caterpillars at his billet". After a year in France he died on 27 December 1915 from pneumonia contracted during the strenuous work with his ambulance unit. He is buried in the Southern Cemetery, Nancy (Grave ref. J.226) (Fortune, 1916 & http://vivientomlinson.com/p33.htm).

Acknowledgements

I am grateful to Martin Limbert for the samples of H.V. Corbett letters quoted in the *Doncaster Gazette*.

Appeal

The author, on behalf of the YNU Historical Section, would be pleased to receive any additional information on YNU members on active service during WW1 or any natural history related non-combatant contribution to the 1914-1918 war effort.

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The role of William Gardner Smith and two of his students in the origins of vegetation surveys, mapping and plant ecology in Yorkshire and Britain from 1897 to 1913

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Introduction

A group of four men met at William Smith's house at 29, Broomfield Crescent in Headingley, Leeds, in December 1904 to discuss and establish a *Central Committee for the Survey and Study of British Vegetation.* Although the meeting was "a preliminary one", it was "thoroughly representative" (Anon, 1905). Convened by William Smith, who acted as the first secretary, the others were C.E. Moss (Manchester), A.G. Tansley (London) and T.W. Woodhead (Huddersfield). All were teachers and would have regarded themselves as professionals (Ayres, 2012). Sir Arthur Tansley (1871-1955) was an eminent academic and plant ecologist and founder and editor of the *New Phytologist*. Thomas Woodhead (1863-1940) was born in Huddersfield, played a major role in plant ecology in Yorkshire, which included the work of the Committee, and was President of the YNU in 1922. Much has been written about both of them and they will not be considered in any detail here. Others, including W.M. Rankin (Portsmouth) were unable to attend but were in communication and later joined, to make up a committee of nine. The others were, M. Hardy (Dundee), F.J. Lewis (Liverpool), R. Lloyd Praeger and G.H. Pethybridge (Dublin). "It was therefore resolved to form a committee of those present together with the other gentlemen" (Anon, *loc. cit.*). Rankin resigned later and William Benjamin Crump joined. Crump was an important Halifax-based naturalist and a close friend of Moss. They corresponded regularly from 1908 to 1912 (WYC 1830/7/2 Calderdale archives at Halifax). "The eleven remaining full members in 1913 became the Council of the *British Ecological Society*" (Lowe, 1976) and at that time the *British Vegetation Committee* ceased to exist. From its formation (1904) and early work to 1912 and its demise in 1913, numerous articles appeared and regular reports of the work of the *Vegetation Committee* were given, for example those by Smith (1905a, b, c, 1912), in the *New Phytologist*.

Charles Edward Moss and William Munn Rankin had been students in and graduates from the Biology Department under Professor L.C. Miall (Miall, 1878) at the Yorkshire College (forerunner of the University of Leeds). (For Miall's life and work see Baker and Bayliss (1983, 1985)). Both were strongly influenced by Miall and by Smith, who was an Assistant lecturer in Botany. As

Smith (1903) put it, he was, "fortunate in securing two co-workers, who have heartily entered into the more laborious parts of the work, and but for them the botanical survey could not have progressed as far as it has". All three played a significant role in the development of surveying and the mapping of vegetation in Yorkshire (Smith & Moss, 1903; Smith & Rankin, 1903; Moss, 1902, 1904) as well as in their wider roles on the Committee and nationally.

William Gardner Smith (1866-1928).

Smith was born in Dundee, came under the influence of Professors D' Arcy Thompson and Patrick Geddes at University College, Dundee and continental workers, and obtained his doctorate from Munich. He moved to Leeds in 1897 as an Assistant Lecturer in Botany in the Biology Department and stayed for eleven years. After leaving Leeds in 1908, Smith became a Lecturer at the Edinburgh and East of Scotland College of Agriculture based in George Square and was President of the British Ecological Society from 1917 to 1918. He was President of the YNU in 1929.

Soon after he arrived, his younger brother Robert (1873-1900) died. Robert had been a pioneer in vegetation studies in Scotland and William "realised the importance of such studies" (Woodhead & Tansley, 1929) and was determined to continue his brother's work on plant vegetation and apply it to Yorkshire. He commenced his studies around 1899, setting about the work with the help of the two students mentioned.

Smith had joined a department headed by Professor L.C. Miall, who had earlier written about the Craven district (Miall, 1878) and held strong views about the work of amateurs and local societies. He had already stated that "We have had more than enough of unintelligent collecting and unintelligent records of occurrence" (Miall, 1877) and again later "It would be much if I could persuade some few working naturalists to lay aside their technical lists and records of parish distribution, and study the works of nature with open eyes" (Miall, 1895). There seems little doubt that Miall would have encouraged Smith in his new approach to botany but he was to lose half of Smith's time to the new Department of Agriculture. In the staff file, a memo from L.C. Miall on July 5, 1901 states, "in Botany we found it necessary last session to relinquish half of Dr Smith's time on account of the pressing wants of the Agriculture Department". This was later formalised with considerable financial help from outside agricultural funds: "in addition to his present appointment of Assistant lecturer in Botany, Dr W.G. Smith be appointed lecturer in Agricultural Botany at a local salary of £300 a year of which £230 is to be contributed by the Yorkshire Agricultural Council" (University of Leeds Special Collections, Minutes of Council February 19, 1908). Smith resigned in 1908. Whether this arrangement was not to his academic liking or the fact that Miall had retired a year earlier or the attraction of returning to Scotland is not known. His resignation was accepted on his "appointment to a lectureship in Agricultural Botany at the Edinburgh and East of Scotland College of Agriculture" (University of Leeds Special Collections, Minutes of Council May 20 1908, 19 February 1908 and 20 May 1908).

British Vegetation studies and pioneering work in Yorkshire.

The work that Smith was about to embark upon would be defined today as plant geography, "a community or society of plants living together and adapted to certain conditions of environment" (Smith, 1903). This went further than the standard work of the amateurs at that time (identifying and preparing lists of plant species) to include which plants grow together under similar climatic and soil and geological conditions and the effects of wind and altitude.

Put simply there is a "close connection between the plants of a country or other area, and the prevailing conditions of soil and climate" (Smith & Moss, *loc. cit.*) an ecological relationship with adaptations to similar conditions. Tansley (1947) later gave a good general historical account including the continental workers who had laid the foundations there, but until 1903 (after returning "from the east in 1901") knew nothing of Smith's work.

Smith founded the Botany Survey Committee within the YNU in 1902 and was the convenor and secretary and an active member of the Union. In 1903 he suggested how this work might be accomplished with the help of local naturalists' societies (Smith, 1903). Tansley (1904) had written in a similar vein: "One of the most crying examples of the waste of good work and sound knowledge in the field of modern botany, is the utilisation of the work of the local botanists and the local field club…Convince them of the interest of ecological survey work, and you would secure their co-operation in working out and mapping local floras…. I would like to see a central committee formed for the systematic survey and mapping of the British Isles" (cited by Ayres, 2012). Smith commented further that "It seems natural that men familiar with a neighbourhood after years of observation should be useful colleagues in such a survey". Alberti (2001) put it succinctly by stating that, "Smith set out to harness the (potential) amateurised might of the YNU for ecological projects, and to proselytise the concepts central to ecological plant geography: namely, the notion of a plant association, the relationship of flora and their environment, and the importance of botanical mapping". This was at a time when "natural history was at its peak", when professional scientists "were appearing in strength" and when the "early plant ecologists offered scientific leadership at a time when natural history was in search of a new direction" (Lowe, *loc. cit.*).

Although the subject could have been an effective vehicle for the participation of amateurs, many were not convinced, keeping to their old and familiar ways. Crump (1931) has suggested that articles written by Moss in *The Naturalist* (1900-1901) were controversial and "injured him in the eyes of the older school of Yorkshire botanists, who consequently received rather coldly the new ideas about plant associations". However a few were eager to participate. William Nowell, founder of the Hebden Bridge Natural History section of the HBLSS (Baker, 2016), was one of those. Speaking at Hebden Bridge in 1907 on *The Examination of flowering plants* he said that "field work should not be looked upon as exhausted when the student had acquired a knowledge of the name and characteristics of the plants in the locality… [and is]…a stepping stone to broader fields of research…soil, water, winds, light, altitude and the life history of each species should be drawn up from the data obtained". The reference to this lecture can be found in HBLSS Natural History Section minute book March 1906 to 1911.

As a result, there developed a possible new found collaboration between some of the amateurs and professionals and "the division of labour meant that the amateurs were then able to contribute to a rigorous, systematic enterprise, without threatening the authority of the academics" (Alberti, *loc. cit.*). However, the Smith type of survey work never really caught hold, lacked the necessary funding and new recruits and, with the changing orientation of the Committee, vanished as Smith had turned his attention to Agricultural pursuits by 1910 (Fischedick, 2000).

Charles Edward Moss (1870-1930) – teacher, academic, curator, Professor of Botany and naturalist.

Moss was born near Stalybridge in Cheshire on 7 February, 1870. His father, a church minister, moved to Halifax when Charles was about four years old and Charles settled in Halifax until he was thirty years of age. Following a serious illness in the early 1890s, he was advised to spend a year out of doors and thus developed an interest in botany. He went on long rambles on the hills and moors around Calderdale (Moss, 1902), often in the company of members of the Halifax Scientific Society, which he joined in 1892 (Bunting et al, 1995). He became an editor of the *Halifax Naturalist* and was one of the society's prominent members. Moss thus learned his natural history in the field with his local society.

Figure 1. Charles Edward Moss from the Moss obituary – see Crump (1931).

Moss was known for his outspokenness which not infrequently gave offence and he often made derogatory comments about others in writing - "How curious you should meet Rankin. Just like him to be choked full of information" (Moss to Crump 23 August 1909 (WYC 1830/7/2 Calderdale archives at Halifax)) and "Crossland's whole everything is summed up in his statement that – like the Stuart Kings – he can do no wrong" (Moss to Crump 27 October 1910 - - idem). [Papers relating to Moss in the Halifax Scientific Society 1865-2003 records at the West Yorkshire Archive Service, Calderdale - WYC: 1830/7/2 1909-1912. Botanical correspondence, letters relating to botany, largely from C. E. Moss (1 bundle), plus WYC:1830/9/1 1930. Obituary of Charles Edward Moss (1870- 1930) with newspaper cuttings relating to his death (1 bundle)].

Moss was 25 years of age when he entered the Yorkshire College as a Queen's Scholar in 1895, having been a teacher in Halifax. At that time the Yorkshire College (with University College, Liverpool and Owens College, Manchester) was part of the Victoria University. After three years of study in a variety of subjects, including education and teacher training, he specialised in Botany and Zoology and graduated in 1898 with a BSc (Vict.) Division 2 (Yorkshire College Register of students vol. 3 [65-657], student number 2621). At Leeds, two of his teachers, Professor L.C. Miall (Baker & Bayliss, 1983, 1985) and W.G. Smith had a profound influence. Miall taught him the method of enquiry – how and why, and a critical scientific outlook and Smith led him in the direction of botanical survey work.

He worked at an 'Elementary School', Fairweather Green in Bradford but continued with his studies at Leeds and later was a science master at Sexey's School, Bruton in Somerset (1901-02), where he did the botanical mapping of Somerset. Then as a lecturer in biology at the Pupil Teachers' College (Manchester Teachers' Training College, c.1902 to 1907). He moved to Manchester in order to study at the university, although he continued to assist Smith in vegetation mapping, and he gained further degrees, an MSc(1905) and a DSc (1907), most likely combining his part time study with his work as a college lecturer, and remained a registered student at Manchester until 1905 (James Peters to authors 11 November 2016). However, by

1910 he was writing "I have lost all interest in degrees. A good published paper is worth a basketful of them – and I seem on my way to getting a basketful" (Moss to Crump 7 July 1910 (WYC 1830/7/2 Calderdale archives at Halifax). He became a Fellow of the Linnean Society in 1912.

His single sheet 'diary' for this period (WYC 1830/9/1 Calderdale archives at Halifax) gives some idea of his life at this time and includes entries such as 9 April 1907, "death of mother"; August (no date) "Tried for Birkbeck College [ex Prof Blackman]"; 10 Feb 1908; "Botany School Cambridge – Enter Emmanuel"; 10 March 1908 "WGS [Smith] begins at Edinburgh in October"; 12 October 1908 "Irish Trip"; 10 January 1910 "Trip to Algeria".

In 1908 Moss moved to Cambridge as Curator of the Herbarium at the University (1908-1916), where he concentrated on taxonomic work, and then moved to South Africa as the first Professor of Botany at Witwatersrand University (1916/7-1930), where the herbarium is named after him. He died in Johannesburg, South Africa on November 30th 1930. Documents in the Witswaterand University Archives (contact was Elizabeth Marima) give some details of his life and career in South Africa.

William Munn Rankin (1879 - 1951) – Teacher, Technical College Principal, author of scientific textbooks and naturalist.

Rankin was born at Skipton, Yorkshire, the son of Robert George Rankin and Ann Elizabeth Lambert and died in hospital at Lyme Regis on 13 January 1951 - newspaper obituaries occur in the *Bournemouth Daily Echo* 18 January 1951, *Burnley Express* 17 January 1951 and *Proceedings of the Bournemouth Natural Science Society* 1950-1951, 41: 61-62. Having taught in the north and south of the country and acted as a college principal and administrator in Technical Education he was also an able naturalist and contributor to the activities of local natural history societies. He made important contributions to botanical surveys and mapping in Yorkshire (Smith and Rankin, *loc. cit.*). In 1903, for example, he compared the old with the new approach to the work in solving problems: "There is a danger of thinking that the robbing a countryside of its rarest plants, to be carried home, dried, labelled, and buried in sheets of paper, is the beginning and the end of botany. The present method puts no premium on this; the commoner plants are the most observed, and yet there is a place in our scheme for the rarest" (Rankin, 1903, and quoted by Lowe, *loc. cit.*).

Rankin was 18 years of age when he entered the Yorkshire College in 1897 from Skipton Grammar School as a "West Riding Free Student". Initially he studied mainly leather science, followed in subsequent years by a variety of subjects, dominated by chemistry but with "elementary and advanced botany" also. He graduated with a BSc. Division 2, in 1900 but remained attached to Leeds as an "Associate" in Botany in the 1900-01 and 1901-2 sessions (Yorkshire College Register of students vol. 4 [658-1000] student number 3230) but was probably attending part time and no longer living in Leeds. Later he was awarded a first class honours degree in Botany by London University in 1905 and in 1909 The University of Leeds awarded him an MSc in Botany (*honoris causa*) for his research on plant ecology in the Pennines.

He taught briefly in Leeds and was on the staff at Portsmouth Municipal College in the early 1900s. Records show that he was there in 1903-1904 where he taught Chemistry and Zoology

to day classes and chemistry, botany and physiography to evening classes (Anna Delaney pers. comm. 26/10/2016). Records show that he was at a Technical School (The Storey Institute) in Lancaster by 1910.

Rankin became the first Principal ('Headmaster') of Science and Technology at the new Bournemouth Municipal College (1912 -1917) while remaining active in local natural history circles as a member of the Bournemouth Natural Science Society and was Chairman of its Council in 1917. "A hundred years ago, he proved a very valuable ally to the Society by facilitating our future by allowing us within the body of the newly-built College at Bournemouth" (John Cresswell, *Bournemouth Natural Science Society* historian, pers. comm. 26/10/2016.). He produced a wide-ranging and impressive list of papers published in the *Bournemouth Natural Science Society Proceedings* between 1914 and 1927 and was made an Honorary member in 1920.

Figure 2. Burnley Natural History Society August 1927 meeting at Holme Hall, Cliviger, Burnley on the retirement of the Secretary of the Society, Mr Richard Jump. W.M. Rankin seated third from right and described here as "Principal of the Municipal College". Mr Jump is third from left and the President, Ernest Evans, is seated next to Rankin. With permission and help from Burnley Central Library.

Rankin then moved back north to become the first Principal of Burnley Municipal College (1920-1940). Some measure of the respect and experience he held in this sector is indicated by the fact that he became President of the College of Principals of Technical Colleges and continued his work in natural history with the Burnley Natural History Society. In addition to his administrative work, Rankin also wrote several books, mainly of a text-book nature. He was the author and co-author of several books on botany, food and nutrition and textiles, including *Foods and Nutrition* (with Egbert Manfred Hildreth, a lecturer at Burnley College), *Textiles in the home*, *Intermediate Domestic Science*, *Higher School Systematic Botany* (part 6 of a Textbook of Botany for students), He also revised C. L. Laurie's *Elementary Botany* 13ed. in 1950.

On retirement Rankin moved back south to live at Whitchurch Canonicorum between Lyme Regis and Bridport, Dorset. He became a WEA lecturer/tutor and re-engaged with former naturalists in the Bournemouth Society, reading his last paper with them in March 1950 (less than a year before he died) on his "Earlier botanical researches in the Pennines".

The formation of the British Ecological Society.

The British Ecological Society is the oldest ecological society in the world, founded "to promote and foster the study of Ecology in its widest sense". Sir Arthur Tansley became the first President at the inaugural meeting at University College, London, on 12 April 1913. Smith became an honorary member of the newly formed Society and its President in 1918 and 1919.

Although the origins and history of the British Ecological Society are well documented (The National Archives, NRA 24453; GB 1858 BES [British Ecological Society]), one of the most interesting aspects of the present study is the part played by Yorkshire-based members of the *Central Committee for the Survey and Study of British Vegetation* in the formation of a national society. Correspondence to Crump from both Tansley and Moss throws further light on developments at the time. Tansley wrote to Crump (17 May 1912 (WYC 1830/7/2 Calderdale archives at Halifax,) "the affairs of the Committee seem to me to have reached a critical stage, and it is a question if it will not rapidly fall into a moribund condition if we are not careful. Possibly an entire change of constitution might save it". Later in the same year Moss wrote to Crump indicating that change of direction (16 December 1912 – *idem*) the Committee, "decided to form a society, and discussed its constitution, etc. The 'Fait accompli' is not yet, but will doubtless be done next April. Subscriptions 21/-, for Associates 12/- ..... for affiliated societies 21/-". It would be called the British Ecological Society.

Acknowledgements

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Editors' note

We were very saddened to hear of the death of the lead author, Richard (Sandy) Baker, whilst we were preparing this article for publication. Sandy has provided us with a number of interesting papers relating to former Yorkshire naturalists, and he recently submitted another which we will publish in the near future. Our condolences go to his family and friends. We were pleased to hear that the flag at the University of Leeds was lowered to half mast in his honour.

Agromyzidae new to Yorkshire

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During 2016, four new species of Agromyzidae (leaf-mining flies) were added to the Yorkshire list. Three were recorded in South-east Yorkshire (VC61) and one recorded in North-east Yorkshire (VC62). All four were identified by their larval mines, with two supported by reared material.

Aulagromyza luteoscutellata (de Meijere, 1924)
On 7.10.2016, Barry Warrington (BW hereafter) found mines on Snowberry *Symphoricarpus albus* in Hessle (VC61) which did not fit the usual pattern of known miners of this plant. Images were sent to Rob Edmunds [www.leafmines.co.uk] who suggested the mines were possibly those of *A. luteoscutellata*, albeit rather old and worn.

On 8.10.2016, at a different location (Willerby, VC61), BW found mines (Plate 4, centre pages) on Snowberry; this time, they appeared much fresher in appearance. Again, images were sent to RE, who confirmed these were the mines of *A. luteoscutellata*. This species was first discovered in June and July 2007 in the South of England (Edmunds & Ellis, 2008) as a leaf miner of the non-native honeysuckle *Lonicera etrusca*. It was subsequently found in July, in Kent (Palmer, 2008) as a miner of Snowberry. Homan (2013) examined the distribution and phenology of this species and found tenanted mines in August and thought that this species had two larval generations – one in June/July and another in August. Homan (2015) discovered fresh, green mines in November on Himalayan honeysuckle *Leycesteria formosa*. BW conducted further searches (VC61) for these flies and found additional fresh mines, which would support Homan's opinion that *A.luteoscutellata* is bivoltine.

Aulagromyza tremulae (Hering, 1957)
BW found the distinctive mines (Plate 4, centre pages) of *A. tremulae* on Aspen *Populus tremula*, 28.9.2016 in Hessle (VC61). This species forms a pale, yellowish, lower-surface corridor (almost blotch-like in some instances) with irregular sides with frass in irregularly scattered, fine grains. Tenanted mines were collected and larvae vacated the mines to pupate via an exit slit in the lower epidermis. Unfortunately, no adults were reared through. However, the larval host plant, shape and position of the mine combined with pupal features confirm *A.tremulae*. This species has not been found at any other localities in Yorkshire, with the Hessle record coming from a very small, secluded strip of Aspen close to the Humber estuary. Further searches throughout the county may show that this species is more widespread than it initially appears.

Phytomyza astrantiae (Hendel, 1924)
On 15.10.2016, BW found several tenanted mines on Great Masterwort *Astrantia major* in York (VC62), which were caused by *P. astrantiae*. Several tenanted mines were collected and a male emerged 02.2.2017 and a female 20.2.2017 (both forced emergence). The male's genitalia were examined to confirm the species. *P. astrantiae* forms a gallery/blotch-like mine (Plate 4, centre pages) that is brown in colour, with a pale yellow margin. Fresh mines are relatively pale, darkening with age and larvae can often feed communally. The first UK record of this species

was made by David Manning in Bedfordshire, in 2009. It has since been found to be widespread throughout the country and may well be overlooked in Yorkshire.

Phytomyza petoei (Hering, 1924)
BW found mines (Plate 4, centre pages) of *P. petoei* on a wild mint *Mentha* species in Hessle (VC61), on 28.9.2016. Mines were collected and an adult male emerged 8.1.2017 (forced emergence), confirming the determination. Surprisingly, this represents the first record for Yorkshire, despite the species being common on garden mints throughout the country.

Acknowledgements
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Transfer of North and East Yorkshire data to the NBN Atlas

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Changes have become necessary regarding the move from the NBN Gateway to the new NBN Atlas. Key elements are the removal of differential access controls and the adoption of Creative Commons licenses replacing the old NBN Terms of data use. See: https://nbnatlas.org/help/data-licenses/ for more information. NEYEDC intend to upload the records we hold to the NBN Atlas at 10km resolution under the non-commercial data license. NEYEDC data on the Atlas will be available at the same resolution and permissions of use as was the case on NBN Gateway.

Comments from those with interests in biological records held by NEYEDC should be received by 30 November 2017. Email: info@neyedc.co.uk Tel: 01904 641631. After this we will assume that data providers have no objection to their records being shared in this manner.

A full version of this article can be found at www.ynu.org.uk/news/NEYEDC

Moving into the information age: From records to Google Earth

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Introduction

Many of us are avid recorders of Yorkshire's varied flora and fauna. Over a recording career of many years a single recorder can personally amass large data sets or, if involved with networks of similarly minded people, groups of recorders can rapidly build truely massive data sets numbering many tens of thousands of records. Sometimes we wish to make sense of these large data sets by mapping their geographic location, perhaps to understand distributional trends in space across time. Though data sets can be easily mapped in software such as MapMate or Levana, the resulting maps are basic outline projections of the reference region on which records are plotted (Plate 5, centre pages). Though useful for understanding distribution in the abstract they lack the directness (and ability to zoom in and out) offered by scaleable photographic representations of location as provided by satellite imagery embedded and rendered in a digital environment. As County Butterfly Recorder (Butterfly Conservation) for Yorkshire I wished to make use of the software Google Earth, which is the pre-eminent example of scaleable mapping software, to map butterfly sightings across a number of years. The object was to motivate recorders in the coming butterfly-recording year to go out and explore those parts of Yorkshire which had not so far provided any butterfly sightings. The problem was how to take almost 75,000 records, representing just two years worth of butterfly sightings, currently residing in the butterfly software Levana, and plot them in Google Earth. This turned out to be a relatively painless journey but requiring some tricks that I thought it would be useful to share. I would hope that this article will allow other people with data bases of records that they would like to present in Google Earth to do exactly that.

Method

Stage 1. We start with whatever system your current records are in. I keep my butterfly records in Levana – others may keep their records in MapMate or in Excel. Most recording software will offer an export function which takes internal data records and outputs them into another generic file format suitable for other software to read. A common output file format is called .csv where data are separated by commas. Levana takes records consisting of dates, grid references, site names, species, number seen, recorder etc and outputs all these as tab-separated values (.txt file). Levana's export function has several variables which can be set to select only those records which you are interested in exporting – I wanted to export all butterfly records in Yorkshire in 2015 and 2016, so I selected those for export. You should now have an output file (.txt format for Levana).

Stage 2. The next step is to import the exported file into Excel (or OpenOffice spreadsheet, etc). If you keep your records in Excel spreadsheets already then skip the previous paragraph and this one! If not read on. Open Excel up and open the .txt file (your output file might be different, say .csv, which will depend on the original software you use). You will need to navigate to the correct folder and make sure that you have told Excel to look for the file format that your exported output file is in (setting to All Files (*.*) in Excel is the easiest way). Excel will ask you a series of questions about the file you are reading in related to the way it is structured – I

have found that for .txt files accepting all the default answers to those questions gets the data into Excel. The questions ask consecutively whether data is delimited or fixed width (they are delimited), what the delimiter is (it's a tab), and what data format the columns are (they are 'general' being a mix of text, dates and numbers). You should have something like Figure 2.

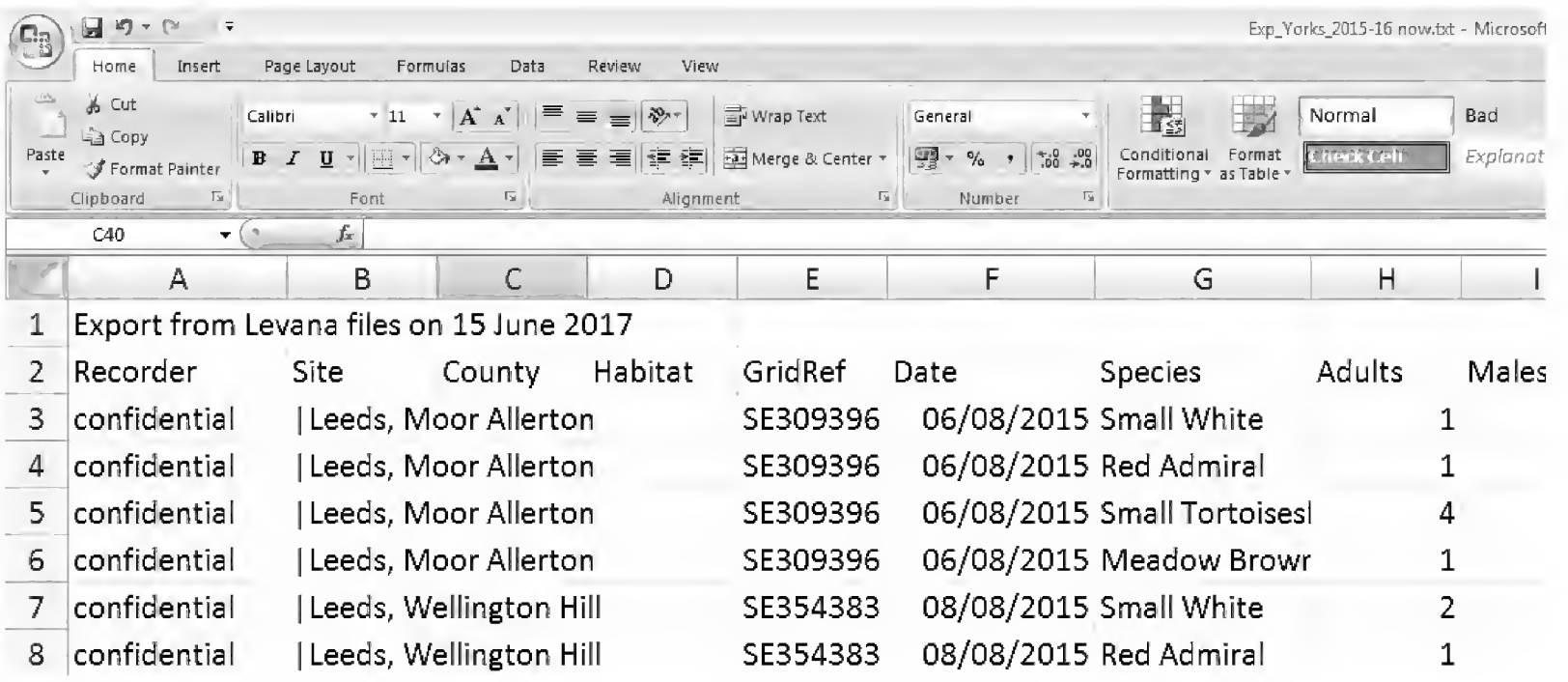


Figure 2. Results of reading in the exported file into Excel. Entries in the recorder name column have been relabelled for confidentiality.

Stage 3. At this point the file has more columns than you need. I only want grid references. So delete all columns except the GridRef column. You should have something like Figure 3.

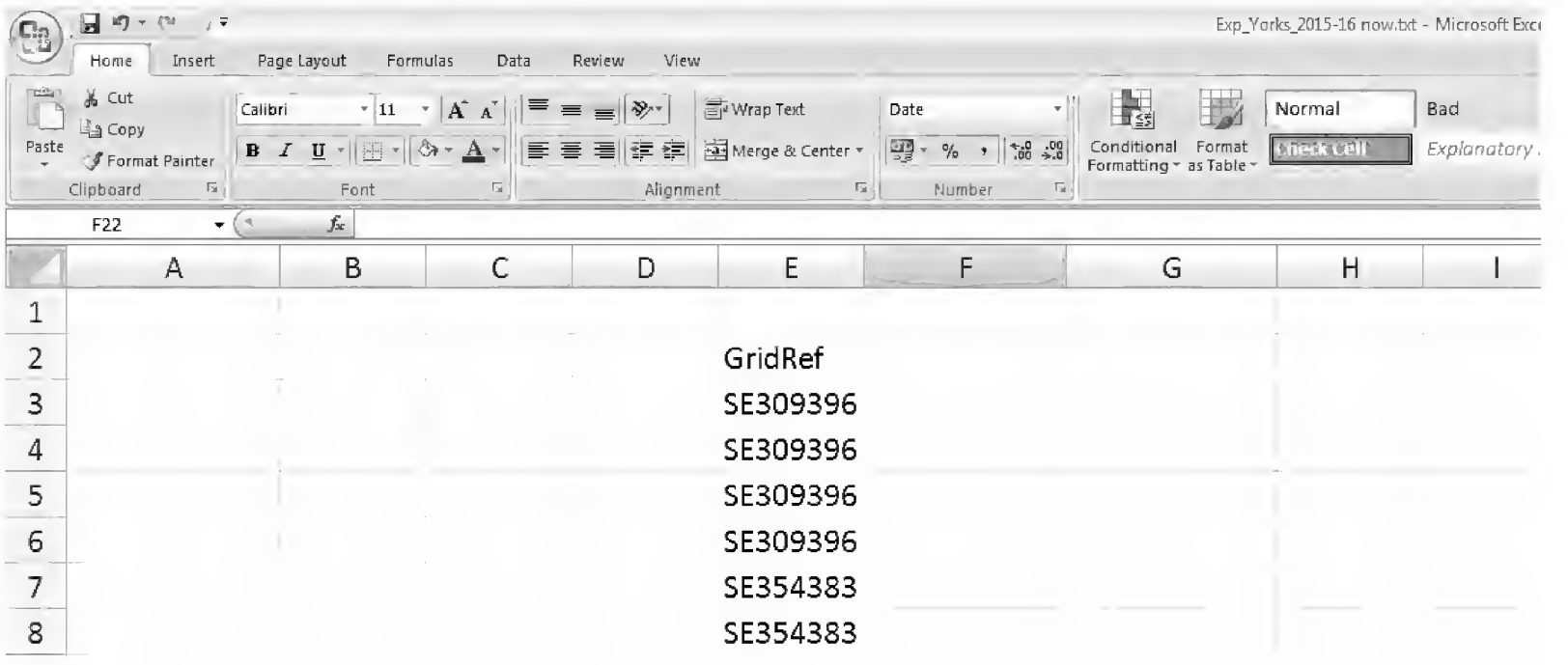


Figure 3. Only the GridRef column has been left.

Highlight the remaining column, go to the Data tab, click on Remove Duplicates and click on OK. What I have done is remove all entries that are duplicated – so the 300 visits to that popular butterfly location are reduced to just one entry. This results in just over 63,000 grid references being discarded from the Excel file and leaves just under 8,000 unique grid references.

Stage 3a (optional). If you only want to plot your sightings in Google Earth (at the resolution

they are at) then this stage can be skipped. For my purposes, I wanted to put a pin in every monad (1 x 1km square) that had been visited so that by omission people would know which monads in Yorkshire had not returned a butterfly sighting. So I am faced with the problem that many of the 8,000 or so unique grid references in my Excel file are different locations within the same monad – I want to treat all locations within the same monad as being at the level of the monad. This means that higher resolution grid references (such as SE567453) need to be converted into lower six-figure resolution (such as SE5645). This is the tricky stuff.

First I need to know the length of all grid references. So SE3096 would be 6, SE309396 would be 8 and so on. Within Excel this is very easy. Just type =LEN(E3) in the cell in the neighbouring column. Hit return. This command means take whatever is in cell E3 and calculate its length. If you do not see a number but perhaps a date in cell F3, then make sure that the column F is selected as being in Number format rather than something else such as being in Date format (see the Number box circled in Figure 4).

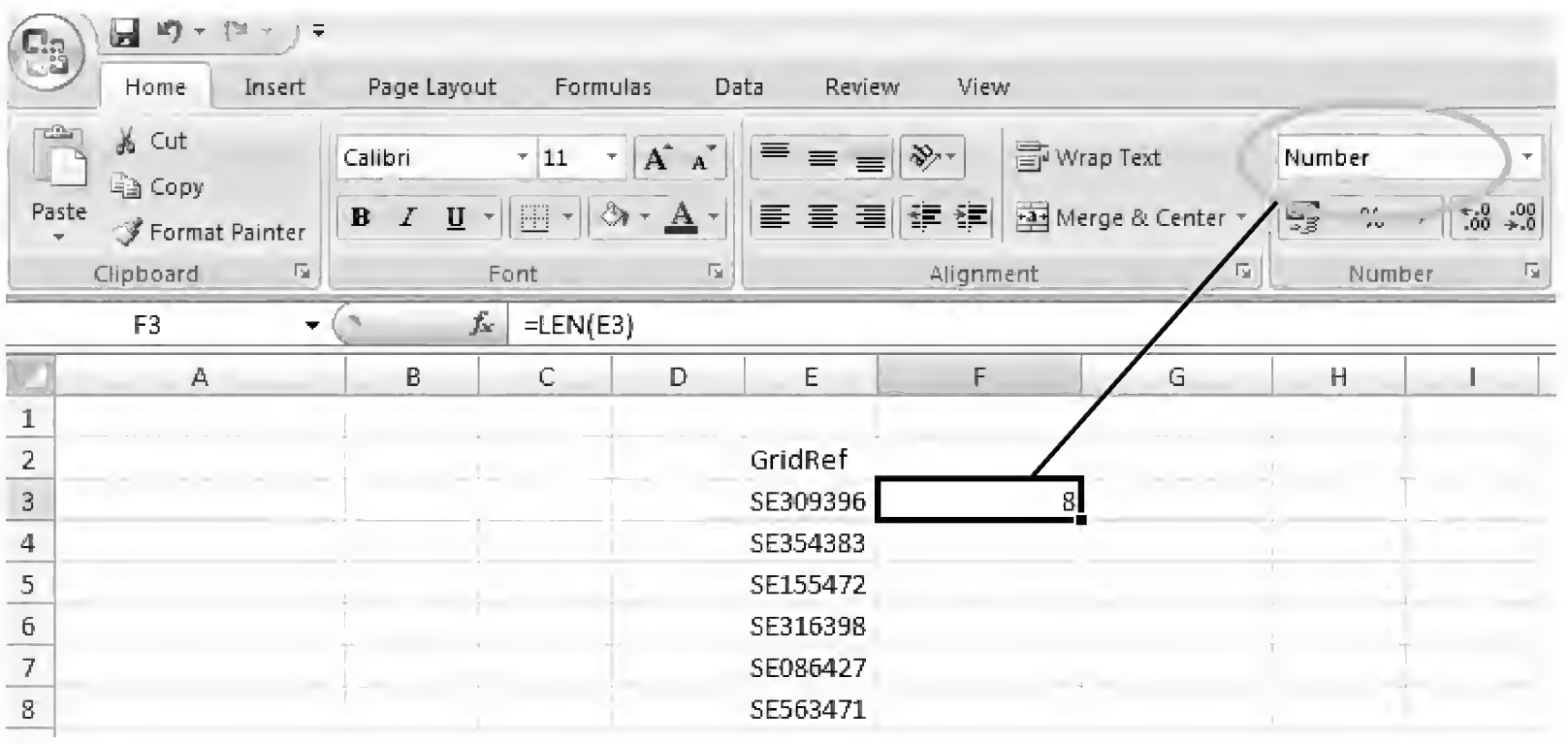


Figure 4. Result after typing in the first formula to calculate the length of the grid reference.

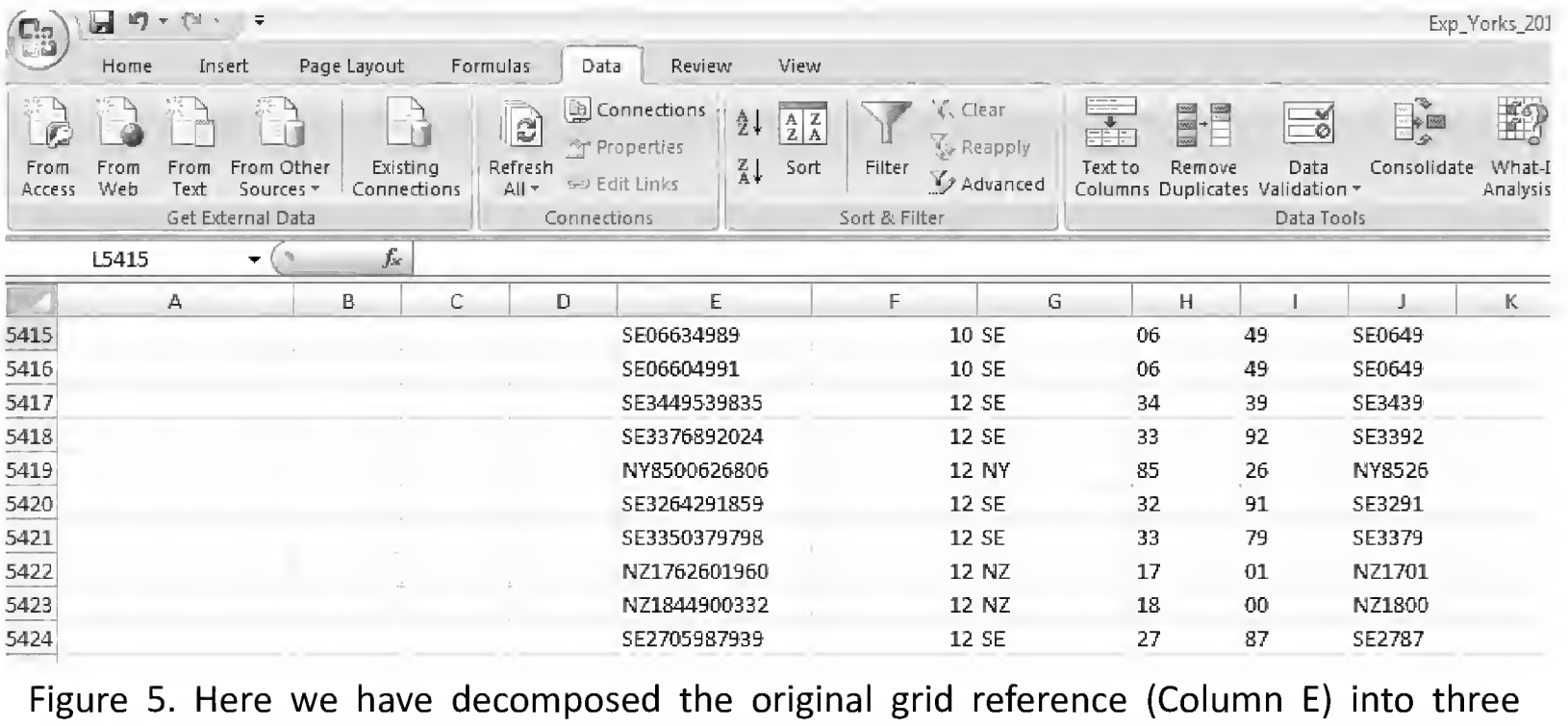
Left-click on the bottom right corner of the black box in cell F3 and drag the box all the way down the column. The formula will be automatically updated so that what was done in the first row is done for all rows you drag the box down. This is the joy of Excel. You should now have for every grid reference in column E a neighbouring entry in column F showing the length of the grid reference. In my Excel sheet this ranged from 6 (i.e., SE3034) to 12 (i.e., SE1428856637). This is resolution ranging from 1 x 1km to 1 x 1m.

You need to have all your grid reference lengths in the file sorted going from shortest to longest. Simply highlight column F and click on the Sort and Filter button in Excel, Sort Smallest to Largest and Expand the selection. The last bit – Expand the selection – is necessary if you have more than one column, in this example of just one column it is not critical.

The next step is to extract only the 1 x 1km part of all grid references. So if it is SE3034 you want SE3034 and if it is SE1428856637 you want SE1456. The best way to do this is decompose a grid

reference into three components each in its own column: so letter code (i.e., SE), 1km easting number (i.e., 14) and 1km northing (i.e., 56) go in separate columns. In column G I shall extract the letter code, by typing =MID(E3,1,2) (you may need to replace the commas with semi-colons if you are using OpenOffice) in cell G3 and hitting return. This simply means look at whatever is in cell E3 and, starting from the first character, extract the first two characters. This will give SE. To extract the easting simply use the formula =MID(E3,3,2) in column H. This means look at whatever is in cell E3 and starting from the third character extract the first two characters. This would give 14. We need to be very careful when extracting the northing as the location of this varies depending on the length of the grid reference. If length 6 (i.e., SE3024), the northing is found by the formula =MID(E3,5,2). If length 8 (i.e., SE306389) the northing is obtained by =MID(E3,6,2). If length 10 (i.e., SE30673897) the northing is obtained by =MID(E3,7,2). If length 12 (i.e., SE3067238971) the northing is =MID(E3,8,2). This goes in Column I. You must be careful that you drag down the formula in Excel to match the length of the grid reference. Each time that you move from one length of grid reference to a new one you will need to manually alter the formula once before dragging the formula down further.

Finally you need to take the three components you have built (letter code, easting and northing) and build them back together to form a monad grid reference in a separate column J. Use the formula =(G3&H3&I3) to achieve this. You should have something like Figure 5. Regardless of whether you originally had grid references of different resolutions, they are all now converted into monads.



	A	B	C	D	E	F	G	H	I	J	K
5415					SE06634989	10	SE	06	49	SE0649	
5416					SE06604991	10	SE	06	49	SE0649	
5417					SE3449539835	12	SE	34	39	SE3439	
5418					SE3376892024	12	SE	33	92	SE3392	
5419					NY8500626806	12	NY	85	26	NY8526	
5420					SE3264291859	12	SE	32	91	SE3291	
5421					SE3350379798	12	SE	33	79	SE3379	
5422					NZ1762601960	12	NZ	17	01	NZ1701	
5423					NZ1844900332	12	NZ	18	00	NZ1800	
5424					SE2705987939	12	SE	27	87	SE2787	

Figure 5. Here we have decomposed the original grid reference (Column E) into three separate components (Columns G to I) and then rebuilt the grid reference at monad level (column J).

We now have our grid reference data in a suitable format for the next stage which is to convert them into the format required for plotting in Google Earth

Stage 4. Copy column J (or if you skipped Stage 3a and you just want to plot the exact location of your records then just copy your column of grid references). Go to the web page http://gridreferencefinder.com/ which takes you to an excellent resource known as the UK Grid Reference Finder. At the very bottom of the web page there are several links. Click on the one

labelled ‘Coordinate Batch Conversion Tool’. This opens a page which essentially converts one kind of location code to latitude/longitude coordinates which can be plotted in Google Earth. Paste the contents of Column J into the empty box space under ‘Step One – Paste your data to convert’. Then select the ‘Grid Reference’ radio button. Click on the ‘Step Five – Convert’ button. Click on ‘Step Seven – Export to Google Earth (KML) File’. This will save a file called GridReferenceFinder.kml on your computer as a Download. KML files are in a file format used to store geographic information in a way suitable for Google Earth. Rename it whatever you like but keep the .kml suffix.

Stage 5. Double-click on the .kml file. It will launch Google Earth and go to the location of your sighting placing a yellow pin at the location. You can zoom in and out around the area. That is it! If nothing happens then you probably do not have Google Earth installed on your computer. Go to http://www.google.co.uk/intl/en_uk/earth/ and download the appropriate version of Google Earth for your operating system and computer. Now double click on your .kml file.

Stage 6. Each yellow pin comes with a label Point 1, Point 2 and so on. This can become a problem if you have many pins because it clutters the map and seriously hampers the smoothness of movement within Google Earth. Go to the left side-bar in Google Earth and locate your My Places folder. You might have to expand the folder to see all the folders within My Places. You should be able to see lots of yellow pins each with a tick mark against it. This means that the pin is showing on the map – you want to keep the pin showing but make the label associated with the pin invisible. Right click the label for your yellow pin (Point 1) and select Properties. In the popup window you need to left click on the tab called ‘Style, Color’. Then change the Label scale to 0. You are still plotting the label but with a size of 0 so that you cannot see it (see Figure 6). Click on OK. As long as all the yellow pins are in the same folder (and if they are not then make sure they are by copying them into one folder) then, to make all the pins in the folder have invisible labels, right click on the folder containing all your pins and select Properties. In the ‘Style, Color’ tab make sure that you click ‘Share Style’, and then click OK.

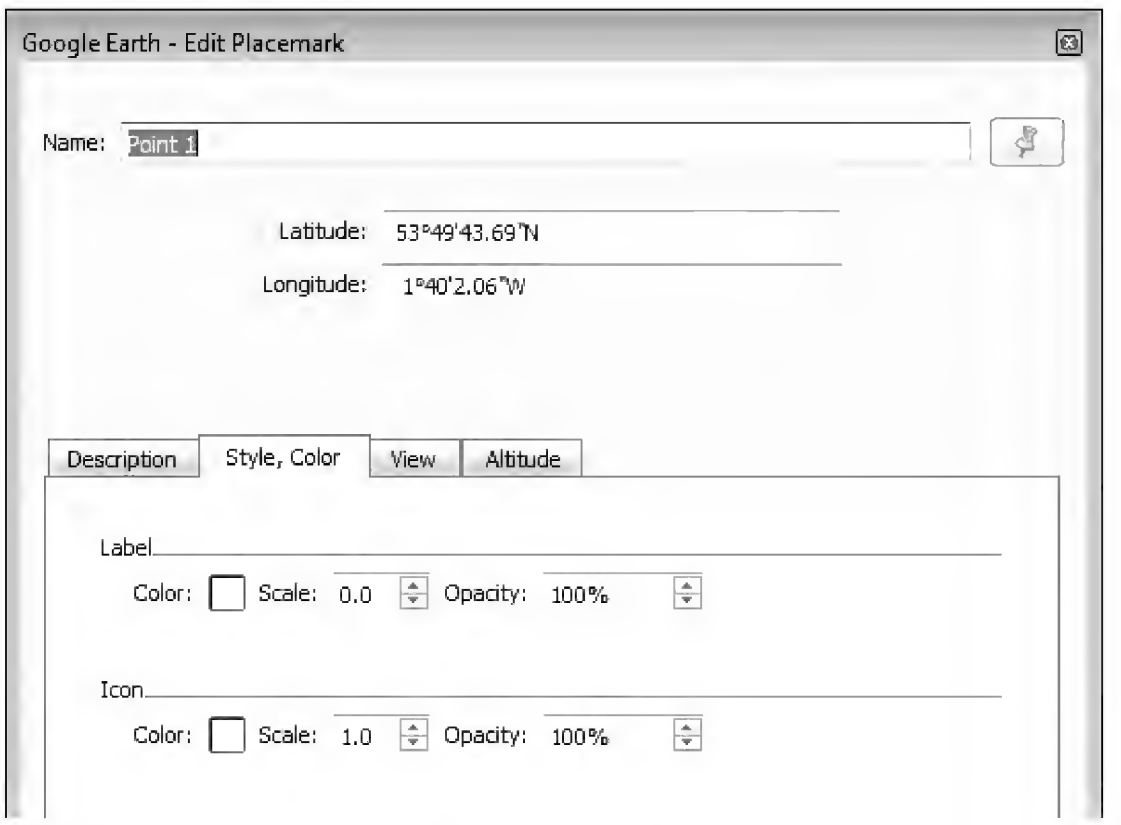


Figure 6. Plotting invisible labels requires you to set the Label Scale value to 0.

Extras. You can do lots of wonderful further things with Google Earth but I don't want to overburden this article. The 'missing squares' for butterflies which I developed can be found at http://www.yorkshirebutterflies.org.uk/missingsquares.html This is a slightly more sophisticated version with the five VCs outlined in red, thousands of sightings located at different monads on a regular grid, with OS grid reference coordinate lines, all parcelled up into one big file (called a .kmz file). KMZ files are many kml files that are compressed into one convenient package file. The lower map on Plate 5 (centre pages) shows an example screen shot showing the whole of Yorkshire.

Acknowledgements
My thanks to Paul Millard for assisting in my first attempts at mapping and directing me towards the gridreferencefinder website and its handy way to convert data into .kml format.

Book Review

The Birds of Spurn by Andy Roadhouse. 2016. pp703. HB: ISBN 9780956557179. RRP £52.50 incl. p&p. Spurn Bird Observatory Trust, East Yorkshire.

Forty years ago, many birders – even amongst those hailing from Yorkshire – enjoyed something of a love/hate relationship with Spurn. It could be a bleak, unforgiving place, difficult to cover and a bit of a black hole news-wise in those days, yet its prominence in annual 'BB' Rarity reports, its remote location and distinctive topography lent it a mystique and attraction all its own to those birders 'in the know'. Back then, Fair Isle was very much the bird observatory in Britain and was the destination to aspire to for those with an interest in migration and with the associated occurrence of rare birds. Fortunately, over the past 20 years the work of a dedicated group of Yorkshire birders has successfully raised the profile of Spurn Bird Observatory and helped put it well and truly on the map.

In the interim, the 1980s saw the rise of visible migration watching amongst birders, which in turn brought about rapid changes in the understanding of seasonal bird movements and patterns of vagrancy across Britain. This new wave of birders included Andy Roadhouse from Rotherham who, along with several of his birding cohorts, adopted Thrybergh Reservoir as his regular 'vis-migging' site. Andy quickly developed a passion for this mode of birding and his careful record keeping and attention to detail was to stand him in good stead for the then unforeseen birth of *The Birds of Spurn.* Diagnosed with terminal lymphoma in 2005, Andy spent most of the last few years of his life as volunteer assistant warden at Spurn, devoting much of his spare time to the writing of this book, encouraged and supported by the regular Spurn 'crew'. Between them, their combined efforts have resulted in the development and establishment of the new, improved (and relocated) Spurn Bird Observatory, it's now infamous annual 'Migration Festival' and the encouragement of a new generation of young birders, and it is to these worthy birding causes that the proceeds of the book will go.

The Birds of Spurn is an impressively weighty, case-bound volume running to over 700 well-illustrated and fact-filled pages. Design is both uncluttered and modern, encouraging both

regular 'dipping' (no pun intended!) as well as lengthy, in depth trawls and is testament to the work of designer Chris Gaughan at Designwing.

A brief but fascinating introductory section provides a potted history of Spurn – which rightly includes mention of the early work and achievements of such renowned Spurn characters as John Cudworth, George Edwards and, of course, long-time warden Barry Spence – and sets the scene for the remaining 600+ pages which are occupied by the individual species accounts. These cover all 388 species recorded to 2014, and include a seasonal breakdown for those species that warrant it. For those species with 20 records or less, full details of each occurrence appear, with many of these fleshed out with inspirational and evocative finder's accounts – highlights of the book for me. Each species is illustrated with either original artwork or with a photograph, the latter taken wherever possible actually at Spurn – an impressive feat of research in itself. The book is stuffed with maps, graphs, charts and statistics: maximum counts, earliest & latest dates, changes in status and ringing summaries but, far from being dull, these are presented in a colourful, attractive style ensuring that the book will be read for pleasure rather than just turned to for reference. A series of maps showing the location of the many birding hotspots around the peninsula will help those unfamiliar with Spurn to distinguish their 'Sammy's' from their 'Numpties' – always useful when news of a rarity gets out!

Keeping the book 'current' was always one of Andy's intentions and this has been facilitated - for 'Friends of Spurn' (www.spurnbirdobservatory.co.uk/membership) at least - by the inclusion of a folder in which annual updates, issued online to members, can be printed out and stored. Closely following the style and format of the book, these appendices are an innovative and cost-effective way of reducing the need for revised reprints well into the future.

Andy sadly passed away peacefully on 29th April 2017, a few months after seeing the fruits of his dedication and effort finally in print. This already multi-award winning book has well and truly set the standard for other observatories to beat, but I have a feeling that it will be some time before we see a comparable work of such depth and importance – what a legacy!

Whether you're a seasoned birder with an interest in migration or someone planning to visit this hallowed corner of Yorkshire for the first time, this is the bird book to put on your shopping list this year.

PL

YNU Notice: Spurn Migration Festival

The YNU will be exhibiting at Spurn Migration Festival on the 8th to 10th September 2017. This packed weekend includes guided walks, workshops, guest speakers, ringing demonstrations and an array of stalls. Thanks to a generous offer by our affiliated society, Spurn Bird Observatory Trust, YNU members can get a 20% discount off the excellent publication *The Birds of Spurn* by Andy Roadhouse during the Mig Fest weekend – you just need to show your YNU membership card. For further information and to book tickets to this popular event, visit http://spurnmigfest.com/. We look forward to seeing you there!

Book Review

A Natural History of Blackmoorfoot Reservoir, Huddersfield by Michael Denton. 2017. pp528. Published by Huddersfield Birdwatchers' Club. £25 plus £5 p&p. Tel: Mike Denton on 01484 646990 or email michael@atheta.plus.com.

This substantial work is a fitting testimony to the efforts of Mike Denton and his colleagues over at least 4 decades. Mike has produced a book which will be a regular reference point for those who have any interest in Natural History in the Huddersfield and wider West Yorkshire area. As both an ornithologist and an entomologist, and with a deep interest in all wildlife, Mike is an ideal person to produce this authoritative work.

The table given in Chapter 2 summarises the 'life-forms' which have been identified in the reservoir's neighbourhood by Mike, Huddersfield Birdwatchers' Club members and invited specialists, and indicates a total of 2407 species – remarkable by any standards. The bulk of the book is made up of accounts of each of these species, detailing their general habitat needs and outlining their status in Britain, Yorkshire, and at Blackmoorfoot.

Because the book is sponsored by the Huddersfield Birdwatchers' Club, and relies considerably on records from its members, it is not surprising that the first main chapter covers the birds seen in the area. Records for some go back to the 1960s with an inevitable increase in reports in recent years, giving plenty of scope for analysis and comparisons. The other main chapters cover flowering plants and invertebrates, with the latter comprising some 23 sub-sections dealing with all the major groups. The chapter on plants is largely credited to Jill Lucas, whose knowledge of this topic in West Yorkshire will have been of great value. Other chapters cover the remaining taxa, from lichens to mammals.

Mike himself will have been responsible for most of the section on beetles – an astonishing 854 species are described and discussed but most of the other groups are also well covered, except perhaps moths which could benefit from more work. There seems plenty of scope to increase the total of 150 species, especially the micro-moths, and to be able to investigate any changes in the distribution of Lepidoptera which have occurred in the last 30 years.

The book contains a number of fine photographs of birds and insects seen around Blackmoorfoot and has indexes to all species, of both common and scientific names. All contributors are acknowledged and there is an impressive list of references. Inevitably with a book of this nature, it is out of date as soon as it reaches the printing press, but its value lies in its thoroughness and attention to detail. It is a book which all naturalists in the Huddersfield area and beyond will want to refer to because it is a comprehensive snapshot in time and will allow comparisons to be made for many years to come.

PS

Barnsley Naturalist and Scientific Society 150th Anniversary celebration with presentation by Professor John Rodwell

Peter Roberts Secretary, Barnsley Naturalist and Scientific Society
Email: barnsleynats@gmail.com

Founded in 1867, Barnsley Naturalist and Scientific Society has had a regular programme of meetings and field visits recording the wildlife of Barnsley and the surrounding area. To mark the 150th anniversary of the society, a special event was held in Barnsley Town Hall in March 2017. Over 70 people (many of them YNU members) attended to celebrate its success in reaching this historic milestone. The evening included an inspiring presentation by Professor John Rodwell who was a member of this Society as a boy growing up in the Dearne Valley. He of course went on to become one of the UK's best known ecologists. Barnsley Mayor Linda Burgess cut the anniversary cake (see Plate 6, centre pages).

Barnsley Naturalist and Scientific Society was founded when five young men met together in a barber's shop. The society joined the West Riding Consolidated Naturalists' Society in 1870, beginning its long association with what is now The Yorkshire Naturalists' Union (YNU). It was however only in 1883 that ladies were admitted to membership - at half-price. At first members devoted much time to making collections of plants, insects, shells, fossils, etc., and tended to do much of this as separate individuals. Field meetings were limited to one or two a year though the distances they walked were quite impressive. Gradually more field visits were held and as time went on there was less collecting of specimens and more recording of wildlife.

John Rodwell in his presentation acknowledged his substantial debt to the Society for first fostering his fascination with natural history as a boy and the shaping of his eventual career. Expert amateurs were willing to share what they knew; a great lesson in how to encourage the enthusiasm of others. He mentioned some notable figures belonging to the society in days gone by: Edwin Bayford, a major authority on beetles; Mr W. Brady, an expert on land and freshwater molluscs; Arthur Whitaker on bats; and from his time in the society: Dorothy Garforth for birds, Dr Lodwick grasses and Mr Boothman fungi. Present in the audience were some former members of the society from the last 60 years.

John drew attention to the significant role local natural history societies play; they bring together amateurs, experts in their particular specialised fields, who meet socially to exchange information and enthuse others. Naturalists' groups also know about local places that mean a lot to a neighbourhood or a small group of enthusiasts. These are places important for local wildlife; worth protecting from development but their value too often being ignored.

Work done by the RSPB, Natural England, the Environment Agency, Yorkshire Wildlife Trust, the Garganey Trust and others have brought about a great improvement particularly in the Dearne Valley. It is now a wonderful network of open waters, reed-beds, wash-lands, rush pasture and meadow. The use of agri-environment and Woodland Grant Scheme funding to create new meadows, heaths and woodlands, open up exciting possibilities for future naturalists to explore; an opportunity and a challenge for those who follow in our footsteps.

YNU Calendar 2017

Up-to-date information and further details can be found at www.ynu.org.uk/events.

Aug	12	Botanical Section Field Meeting to the Leeds-Liverpool Canal. Meet at 10.30 in the car park off Canal Road, Kirkstall (SE27653404).
	19	**VC63 Excursion** to Dunford Bridge (SE157024). See *The Naturalist* 1094 p76 for details.
Sept	7	Entomological Section Field Meeting at Three Hagges Jubilee Wood, Escrick. Meet at the gate (SE627394) at 10.30.
	9	Conchological Section field meeting,Dentdale. Meet on the north side of the River Dee (SD74208648) at 11.00.
	10	Seashore Bioblitz., Runswick Bay. Meet in the car park on Cleveland Way (NZ80911597, pay and display) at 11.00. The bioblitz is organised by the University of Hull as part of the Heritage Lottery funded 'Capturing our Coast' project and supported by the YNU.
Oct	8	Seashore Bioblitz. South Landing, Flamborough. Meet at the Living Seas Centre (TA23056950, pay and display) at 10.30. The bioblitz is organised by the Yorkshire Wildlife Trust and University of Hull as part of the Heritage Lottery funded 'Capturing our Coast' project and supported by the YNU.
	14	Bryological Section Meeting. Skipwith Common (VC61). Meet at 10.00 in the car park on King Rudding Lane (SE644373).
	14	Conchological Section Meeting Cawthorne Park, Barnsley. Meet at 11.00 at SE27210793. This is a pay and display car park.
	21	Entomological Section AGM, Doncaster. This indoor meeting will start at 11.00 at Doncaster Museum & Art Gallery on Chequer Road (SE57940299).
Nov	18	**YNU AGM & Natural Sciences Forum** at RHS Garden Harlow Carr, Crag Lane, Harrogate HG3 1QB, from 10.30 to 16.00. The Annual General Meeting of the Yorkshire Naturalists' Union will be held in the Wolfson Room at the Bramall learning Centre at Harlow Carr. The price is £12 per person. The agenda and booking form can be downloaded from the YNU website at: http://www.ynu.org.uk/AGM2017

YNU Notice: Conference – plans for 2018

The YNU conference was held on Saturday the 8th April 2017 at the University of York on the theme of *Yorkshire's natural history societies – for naturalists, for nature, for the future*. It was attended by 95 members and friends and was a thoroughly enjoyable event! There was an excellent programme of talks and a wonderful selection of natural history displays provided by YNU members and affiliated societies. Presentations are available to download from our website along with a list of exhibitors and links to more information about their organisations and projects. Our sincere thanks to the speakers, chairs, exhibitors and all the delegates who participated so enthusiastically. We are also very grateful to keynote speaker Roger Morris and exhibitor Zach Haynes for their excellent articles in this issue of *The Naturalist*.

We are keen to hold a conference in spring 2018. Two possible themes which have been suggested are *non-native species in Yorkshire* and *exploitation of resources in Yorkshire's national parks*. If you would like to suggest themes or get involved with the organisation of future conferences, please contact Paula Lightfoot on p.lightfoot@btinternet.com

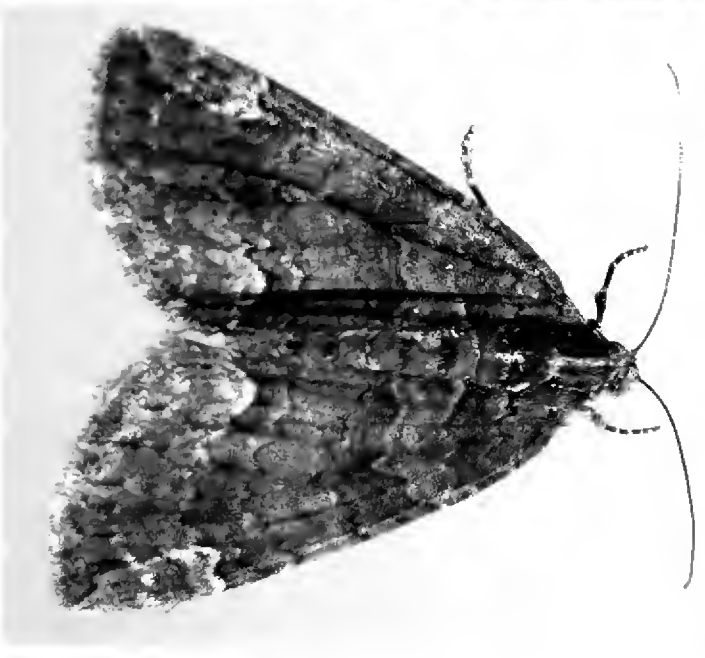


Plate 1. 30 years of garden wildlife (see pp82-96). *Above*: The Headingley garden.
Below left: The hoverfly *Volucella inanis*, annual on Headingley Hill but not recorded by Owen in her garden.
Below right: Tinea pallescentella, one of two *Tinea* species that chewed its way through carpets and clothing throughout the 30 years study period.
Bottom left: Red-green Carpet. Regular on Headingley Hill since 1997.
Bottom right: The main garden pond. *J. Bowers*

Plate 2. Freshwater plants and SSSI canals (see pp104-116).

Right: Leven Canal, September 2015; the open central channel has water-lilies and Arrowhead while the margins are occupied by Common Reed with Common Club-rush encroaching in the middle distance. *R. Goulder*

Left: Leven Canal, September 2015; the channel is kept open by weed cutting; cut vegetation, largely water-lilies, has been heaped on the bankside. *R. Goulder*

Left: Pocklington Canal, June 2015; a more-or-less pure stand of Reed Sweet-grass occupies most of the channel. *R. Goulder*

Right: Pocklington Canal immediately downstream of Top Lock, June 2015; the channel has been opened up by clearance of vegetation the previous February. *R. Goulder*

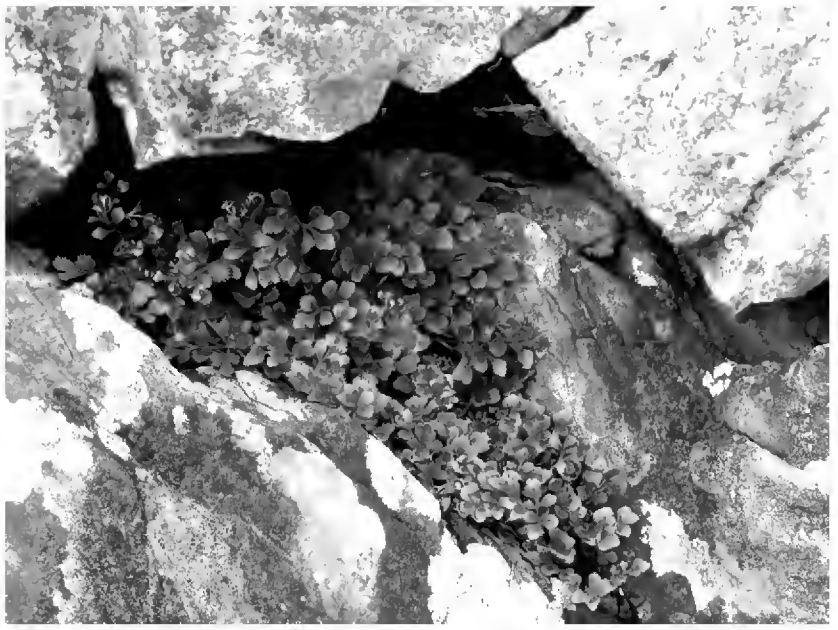
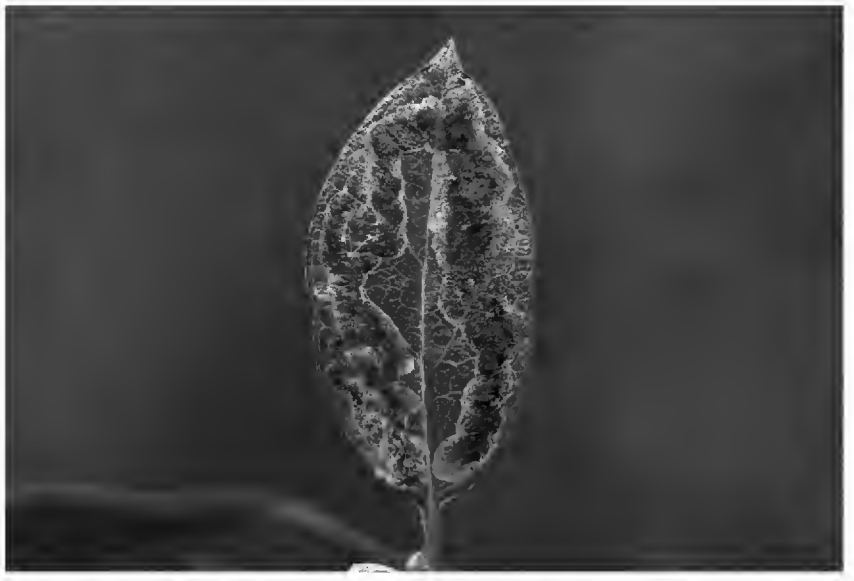
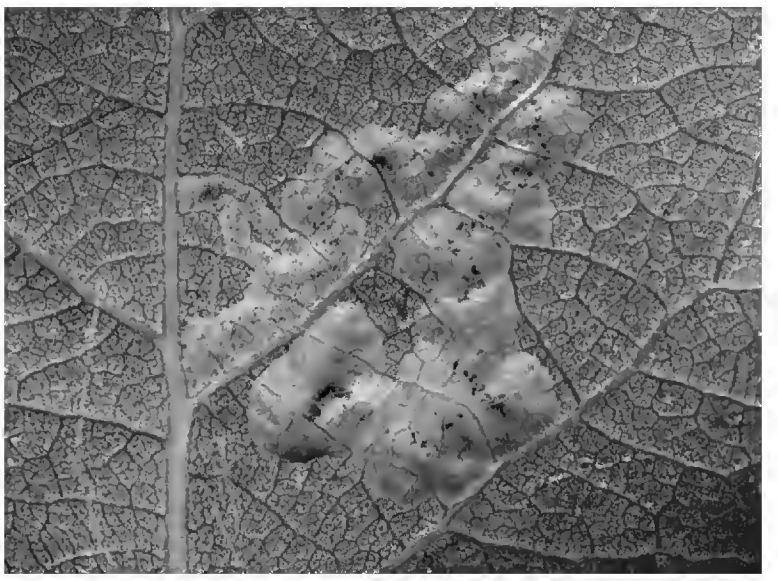
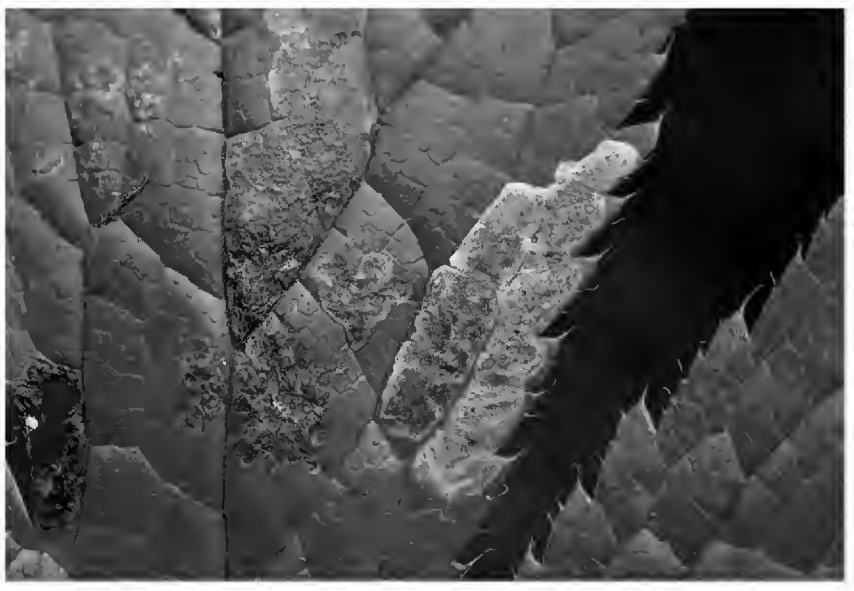


Plate 3. Ferns of drystone walls (see pp127-132).
Top left: Wall-rue *Asplenium ruta-muraria.*
Top right: Common Polypody *Polypodium vulgare.* *M.Pearson*







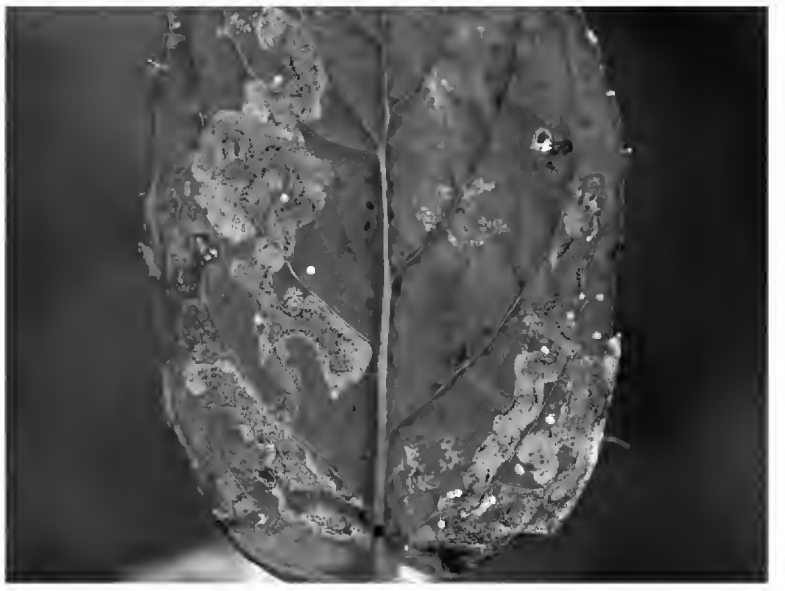


Plate 4. Agromyzidae new to Yorkshire (see pp149-150).
Top left: *Aulagromyza luteoscutellata* mines on Snowberry *Symphoricarpus albus* leaf.
Top right: *Aulagromyza tremulae* on Aspen *Populus tremula* leaf.
Lower left: *Phytomyza astrantiae* forms a blotch-like mine on Great Masterwort *Astrantia major* leaves.
Lower right: *Phytomyza petoei* found on a wild mint *Mentha* sp. *B. Warrington*

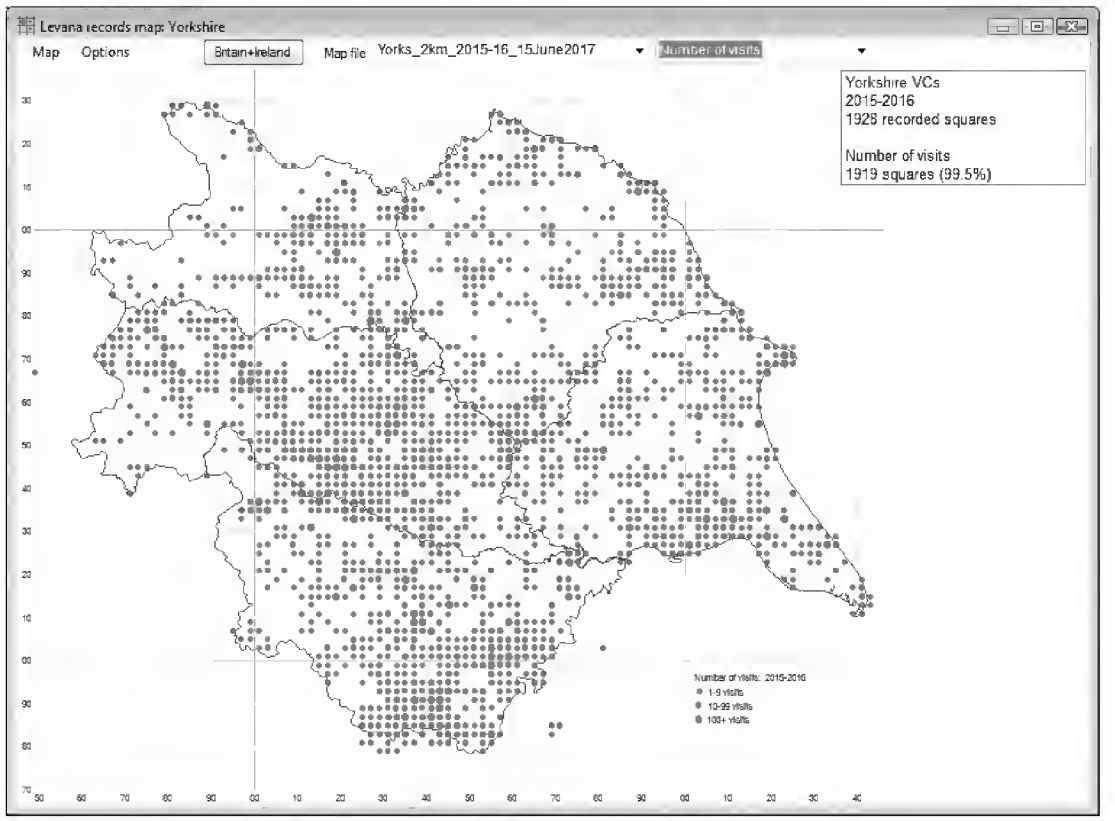


Plate 5. From records to Google Earth (see pp151-156).

Left: Butterfly sightings displayed on a map in *Levana*.

Below: Screen shot of *Google Earth* from about 250 km above Yorkshire, with the 2015-2016 butterfly sightings at monad level.

The lower version shows little advantage on a printed page, but on screen the ability to zoom in to varying scales offers much greater versatility.

D. Smith

Plate 6. Barnsley Naturalist and Scientific Society's 150th Anniversary celebration (see p159).

Barnsley Mayor Linda Burgess cutting the cake with (from right to left) Professor John Rodwell, Gordon Bristowe (Society president) and Peter Roberts (Society secretary).

John Bell